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AGROSTAN

A Case Study for the 1970 World Census of Agriculture

UNIT II. PLANNING AND ADMINISTRATIVE REQUIREMENTS

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Chapter II - 1. INITIAL DECISIONS ON TIMING, SCOPE, AND DESIGN OF THE CENSUS

1. *INTRODUCTION*

An agricultural census can be thought of as the total process of planning for, and the collection, compilation, evaluation, and publication of economic and social data representative of the agricultural sector in an entire country or in a well-delimited part of that country. Planning for a census may well begin with a review of the legal basis for the census undertaking. Legal authority for a census is required for fixing primary administrative responsibility for all phases of a census undertaking, including the determination of the timing, scope, and design of the census; selection of the inquiries and their wording; placing upon the public a legal obligation to furnish the information requested; obtaining the necessary funds for conducting the entire census; and, finally, publication of those data which can and should be made available to users.

1.1 Authority for the census

A decennial census of agriculture for Agrostan was authorized by the National Legislature in 1953 through an Amendment to the Census and Statistics Act of 1948 (see chapter 3 of Unit I of the case study). This amendment made provision for either a complete census of all agricultural holdings or for a sample census, due regard being given to the expressed needs of users of the data to be collected. In the absence of instructions from the Legislature, the method of enumeration was delegated to the Director of the National Statistical Office (NSO) with concurrence by the Minister of Economy. Discretionary power was, similarly, granted to the Director and the Minister to decide on such matters as timing, coverage, and scope.

1.2 Need for the census

Closely paralleling, in time, the review of the legal authority for taking a census of agriculture, is the desirability of reviewing the need for new data or for the updating of facts previously collected. The needs for and uses of census data are described in Units I and IX of the case study. The planners in Agrostan had relatively little data relating to agriculture to review and appraise. Much of the current information was sketchy or was expressed in percentages. It should be remembered that only one previous effort in conducting a census-type of enumeration of agriculture had been made; namely, the 1961 Sample Census of Agriculture.

The 1961 census did not cover the whole of Agrostan but was restricted to the Provinces, where the bulk of the production occurred. That census was limited in scope both as to subject matter and number of holdings covered. Census totals for 1961 did not become available as a base for future estimates until late 1964. Thus, the Ministry of Agriculture, which has the responsibility for keeping abreast of current and expected production, has had few basic totals upon which to estimate numbers of animals or production of crops, livestock, and poultry. Without base figures in the form of numerical totals, many of the current data are given in the form of percentages; such as percentage of total, percentage change, and percentage of normal. Data from administrative records of agricultural development projects, processing plants, exports and imports (described in chapter 3 of Unit I), even if reliable and relatively complete, lack something in that they do not portray the structure of agriculture for individual holdings.

1.3 Responsibility for decisions

The Director of the NSO in Agrostan has tapped a larger reservoir of knowledge, interest, and support for all censuses through the formation of an overall advisory group--the National Statistical Council. Further, since some of the critical decisions which the Director must make lay outside the competence of this group, he also made use of a Working Group composed of members of his staff and technically-qualified personnel from the Ministry of Agriculture (see chapter 3 of Unit I). Although these two groups were assigned specific tasks, it is the Director who has, and must accept, the final responsibility for all actions taken. After consideration of the recommendations of the two groups, the Director made the decisions which are set forth in this chapter under appropriate headings. Some of the questions which needed solution and the reasoning entering into the formulation of the decision accompany the statement of the decision.

Many questions, or problems, which require early solution in planning for any census are interlocked; that is, the decision for one is dependent, in part, on the decision for another. The order of presentation of topics, as given herein, does not necessarily indicate either the time sequence of the decision or the independence of one topic from another.

2. TIMING OF THE 1970 CENSUSES

Agrostan is planning a 1970 Census program which will include a decennial census of population and housing, as well as a census of agriculture. Several decisions must be made with regard to the timing of the Censuses:

> Is simultaneous enumeration of population and agriculture the most effective way of conducting these two censuses?
>
> If not, which census should precede the other and at what interval of time?
>
> What is the most appropriate time of the year for taking a census of agriculture?
>
> Should the information collected refer to 1 year, 1 week, or to a specific date?
>
> If 1 year, should the information be for a calendar year or some other 12-month period?

These are some of the questions regarding the timing of the census of agriculture which are most appropriate for Agrostan or for any other country with a sizable agricultural population or agricultural production.

2.1 Simultaneous or separate timing

Three possible choices exist as to the timing of a census of agriculture in relation to a census of population. The agricultural enumeration can precede the population census, the two censuses can be conducted simultaneously, or the agricultural census can follow the population census.

2.11 Considerations.--The taking of a census, either of population or of agriculture, is a very large undertaking as measured either by dollar cost and impact on the national budget, or by other terms such as availability of qualified manpower, printing and processing facilities, etc. Both censuses require the gathering of information from a large number of units. The families engaged in agricultural operations are subject to extensive questioning in both censuses. The units for enumeration in agriculture (usually the unit is a holding) are widely dispersed (as is also true for rural families in a population census) and are often quite dissimilar as to size, organization, and nature of production, even though located in the same general area.

Moreover, when the two censuses are taken simultaneously, the many reporting, administrative, and control forms require complex manuals for the guidance of supervisory personnel, enumerators, payroll employees, etc. More concepts must be learned. The large number of inquiries may exhaust the patience of respondents, probably with some effect on the quality of the information. The total outlay of money for the enumeration--the highest single item of cost in a census--must be budgeted for the same time period.

The difficult task of relating human resources to agricultural resources should not be overlooked

in making the decision as to the timing of the two censuses. The matter of relating population and agriculture characteristics is of primary concern in every contemplated development program. Knowledge of this relationship will be desirable not only for specific geographic or administrative areas, but also for persons dependent on agriculture whether for the whole of this group or for individual families.

A census of agriculture which is independent of a population census cannot be expected to gather reliable data for that portion of the population not living on a holding but which is dependent on agriculture for a living. Neither should it be burdened with gathering more than limited information about the composition and well-being of wage families living on holdings which are under the management or operation of someone else. A census of agriculture cannot easily eliminate duplication of individuals engaged in work on different holdings. Furthermore, regardless of where they live, the census of agriculture cannot fully identify those families whose members are not holders but who work part-time in agriculture and derive most of their income from other sources.

Decision: After consideration of the several choices, the Director of the NSO ruled that the census of agriculture should follow the census of population.

2.12 Reasons for the decision.--For Agrostan, the next census of population must, according to the Census and Statistics Act, be taken as of 1 May, 1970. Several years are required to prepare for a census of population or of agriculture. Largely because of shortage of trained personnel to prepare for the two censuses at the same time, the Director was forced to narrow his choice to two, not three, alternatives; namely, simultaneous enumeration or scheduling the agricultural census to follow the population census. The third choice, the one which was ruled out, would have placed the enumeration of agriculture ahead of the enumeration of people. It was not feasible to prepare an agriculture questionnaire and procedural plans, to obtain experience as to workability of procedures and questionnaires from pilot tests, or to obtain the necessary funds for initiation and carrying out an agricultural census in advance of 1970.

The census of population, if it precedes the census of agriculture, can be expected to facilitate delineation of enumeration areas for the agriculture enumeration. Moreover, qualified NSO personnel are largely engaged in the population census plans and not available for the agriculture census.

The cost to conduct a complete population census and a sample agricultural census simultaneously was reviewed as a possibility of lowering the total cost and reducing the burden on many respondents. This plan of simultaneous enumeration was dropped because the planning and data-collection procedures would be still more complicated, with some possible further loss in quality of the collected information.

Being aware of all of these points and knowing that neither of the two censuses was likely to be limited in scope, the Director chose to have the two censuses conducted at separate time periods. He considered that improved quality of the data collected would outweigh a possible lower cost if the two censuses were taken together.

2.2 Time reference (year and month)

For the Northern Hemisphere, area and production statistics for crops generally pertain to the harvests of the spring, summer, and autumn of the year stated; but for the more southerly regions of the hemisphere, they usually represent harvests continuing into the early part of the following year. For the Southern Hemisphere, similar statistics generally are given for harvests begun in the latter part of the year indicated and continuing through the first half of the following year. There are some exceptions to this general policy[1].

The Food and Agriculture Organization of the United Nations (FAO) has urged all countries to

[1]For further information on the "Time Span of Crop Harvests" and some departures from the periods specified, whether by international custom or otherwise, refer to the Production Yearbooks of the Food and Agriculture Organization of the United Nations.

take their censuses of agriculture in 1970 or, if this is not possible, in a year close to 1970. The Census and Statistics Act permitted the taking of the Census of Agriculture within 2 years of the 1970 Census of Population.

> ***Decision***: The enumeration of agriculture, for the Provinces of Agrostan, has been set, by the Director, for the month of January 1972.
>
> For the Northern Territory, the census of agriculture will start as near as possible to 15 November 1971.

2.21 Timing for the Provinces.--In the Provinces particularly, the interplay of all forces in the economy is quite dynamic. There is, and has been for some years, a constant net migration of population from the rural areas and hamlets to urban centers. Holdings, in general, are too small to support an expanding population in rural areas. However, some new lands are being opened to settlement. Land reform programs have been initiated, whereby large estates or holdings are being subdivided.

The usual time for taking possession of a new holding or for expanding or contracting the area in a going operation falls between the ending of one crop year and the beginning of another. Thus, it was thought that a portion of the agricultural holders (estimated to be at least 10 percent and possibly 15 percent), might be new to the holding they will be operating at the time of the next census of agriculture, particularly if the date set is unduly delayed or the time of enumeration is prolonged. Another unknown percentage of holdings, but not to be ignored, will have expanded or decreased in total area in respect to the previous year; and this change would likely occur just prior to the beginning of a crop year.

For the 13 Provinces of Agrostan, it has been established that the time period between a date in late December and the middle of January would seem to be ideal for making an agricultural enumeration. However, the holiday season at the end of December in some areas may disrupt normal business and home activities as well as make it difficult to maintain a staff of census enumerators. This situation and the fact that the calendar year is not quite over as of December guided the Director in his decision to begin the enumeration in the Provinces at the earliest possible date in January 1972.

2.22 Timing for the Northern Territory.--Ordinarily, the time interval corresponding to the closing of one calendar year and the beginning of another is ideal for beginning a census of agriculture in Agrostan. However, an earlier date was set for the Northern Territory. It was decided that the enumeration will begin in mid-November 1971, for several reasons.

The composition of a holding in the Provinces can be determined by establishing the area of the crop fields, meadows, pastureland, woodland, wasteland, and land occupied by buildings. A different kind of structural or managerial arrangement is thought to prevail in the Northern Territory. It is known that a tribal form of organization exists in much of that region. Members of a tribe have use of land very much on a freedom-of-choice basis. An area which is cleared by a family engaged in agricultural production is considered to be in their ownership as long as it is used for crop production. After several years of use, such land may be abandoned by a family for crop production and another area taken up (often an area that has been either idle for several years or never reclaimed for use). In much of the region, any land not utilized for crops is open to communal grazing by animals of any member of the tribe. Thus, cropland is an important element in the concept of a holding.

To forestall, and certainly to reduce, the problem of associating abandoned cropland with a holder, it was decided to advance the date of enumeration so as to have the census immediately precede the completion of a crop year. By doing so, the problem of associating holders with crop areas for which they can supply information is lessened. In late 1971, most operators who harvested a crop in 1971 will still be on the land they worked, or close to that land. They will not have had the opportunity, except in a limited number of instances, to have moved from the area or holding to new areas or new lands.

2.23 Use of 1970 population data and other considerations.--The number of households or the number of inhabitants -- basic data coming from any census of population and destined for early tabulation for Agrostan -- could provide the basis for establishing enumerator workloads for a complete census of agriculture or provide the basis for selecting primary sampling units (PSU's) for a sample enumeration of agriculture. A 1970 date, whether in November 1970 or January 1971, would follow too closely after the completion of the 1970 enumeration of population for setting up workloads or a sample of PSU's. Moreover, those dates (November 1970 and January 1971) should be reserved for making pretests which would closely simulate conditions that would be found in the census itself a year later.

To conform with FAO's recommendation for a census near 1970, it is quite logical to establish November 1971 and January 1972 as the starting dates for the forthcoming census of agriculture. Moreover, the dates established for the enumeration of agriculture meet the requirements set forth in the Census and Statistics Act that the census be conducted within a 2-year period before or after the enumeration of population.

2.3 *Period to be covered*

Some types of data are not easily gathered for a 12-month period. Often, useful data can be obtained only if an inquiry is restricted to a recent week, to yesterday (which is the day preceding the enumeration), or to some other specific date. Employment in agriculture, for example, is often related to the period of 1 week in length and ending at the day of enumeration. The number of animals milked may best be related to yesterday. In the determination of the land in a holding, tenure of the holding, number of animals on hand, etc., a specific date is useful. The date may be the day of the enumeration or a very definite or fixed day close to this.

Decision: For the Provinces, data for production and for many activities concerned with the use of equipment, labor employed, utilization of land, sale of products, and family income will relate to the year 1971, except when specifically stated to the contrary. As a general rule, the tenure of the land holding, the inventory of animals, poultry, motor vehicles, and families living on the holding will relate to the day of the enumeration.

For the Northern Territory, inventory items will be as of the day of enumeration. For statistics on production and other items covering a year, the goal will be to include the whole of the year 1971 even though that will require some estimation on the part of the respondent.

2.31 Crop year.--In the Northern Hemisphere, in which Agrostan is situated, the crop year closely coincides with the calendar year. Hence, the decision was made that the calendar year is not only a good but also a convenient point of reference for stating annual production, whether for crops, livestock and poultry, or for measuring most other forms of activity including land utilization, labor employed, income received, etc.

2.32 Day of enumeration.--A more refined or definite date for determination of the total area of the holding, for stating cattle numbers, etc., (for example, 1 January) has been avoided because of the difficulty of recalling past events such as the number of cattle on the holding as of the past date. Numbers relating to the present are easier to give. Numbers relating to a past fixed date raise the question of how many of the animals presently on hand were born on the holding or were purchased since that date; how many died or have been sold; how many were kept elsewhere on that date; etc. Since the number of new arrivals of animals or poultry (by births or by hatchings) increases rapidly with the advent of spring -- early February extending into mid-March in Agrostan -- it is essential from this additional standpoint that the enumeration not be permitted to extend over a prolonged period of time. The NSO was cognizant of the lack of comparability that might result, in livestock and poultry numbers, if the enumeration proceeded at a much slower or faster pace in one province than in another. This difference can be compensated for, in part, by considering the "day of enumeration" at the midpoint of the period of enumeration.

2.4 Length of enumeration period

The duration of the enumeration should be rather short and, if possible, should not extend beyond 1 month. This period is generally accepted and coincides with the recommendation of FAO. A short period lessens the chance for omissions or duplications in statistics for items subject to variability. Movement of livestock, increases or decreases in their numbers, changes in employment in agriculture, etc., can have a material effect on reported numbers if the enumeration period is prolonged.

> ***Decision***: The goal is to complete as much of the enumeration as possible during November and December in the Northern Territory, and during January and early February in the Provinces, with any "clean up" enumeration to be completed as soon as possible thereafter.

A later date not only would require obtaining data from more new operators (wholly new operators or new in part) but also introduces more memory bias; that is, error caused by the necessity for respondents to recall information after successively longer periods of elapsed time. Recall is even more elusive as new events take their place.

2.5 Length of interview time

The limited experience of Agrostan's field personnel in conducting interviews relating to social and economic characteristics has shown that the total enumeration time per respondent should generally not exceed 30 to 40 minutes, including the time required for the enumerator to describe the purpose of his visit. There are cases where more time is required because a respondent consults his records, confers with another member of his family, or engages in conversation not pertinent to the topic being investigated.

The one-crop farmer or any small holder with limited agricultural operations can usually be enumerated with less effort and overall time than the farmer with many and varied activities. More overall time is required if more than one visit to the holding is necessary; for example, separate visits for listing the holdings, interviewing, and carrying out objective measurements.

> ***Decision***: In the general enumeration of agriculture, the questionnaire should be so designed that the average or median time of enumeration should not exceed 35 minutes. A few minutes of this time would be used by the enumerator to identify himself and to explain the purpose of the census.
>
> If objective area measurement is to be carried out as part of the census, it is expected that the average total enumeration time will approximate 2 hours per holding.

Experience has shown that the quality of data is affected by the size of the questionnaire or, more appropriately, by the time required to fill the questionnaire. Thus, it is desirable to limit the scope of the questionnaire so that the average interview time is reasonable.

2.6 Scheduling of the major census activities

The satisfactory and efficient performance of a large number of different tasks which must be carried out in connection with a census requires that a time schedule be prepared so that questionnaires, procedural forms, personnel, tabulating equipment, and supplies will be available when and where needed. Decisions on the timing of major phases of the census must be made early in the planning so that all activities will be properly coordinated.

Detailed time and progress schedules are necessary for each phase of the work to assure completion of the census on time and within the allotted funds. As the work progresses, the scheduling must be reviewed by the appropriate officials and corrective action taken where necessary. If any phase of the job is delayed or uses more funds than were allotted, the whole census may be jeopardized.

The scheduling of activities can be predicated, in part, on previous census experience and pretests of procedures and questionnaires simulating actual census conditions, on the probable number of holdings to be enumerated, availability of qualified personnel to conduct the censuses, the desirable optimum interview time, etc.

> ***Decision***: Timing for the major census activities in Agrostan will begin with a pretest in the Northern Territory in November 1970 and

in the Provinces in January 1971; census enumeration in November 1971 and January 1972, respectively; an Evaluation Survey of a small sample of holdings in the Provinces in April 1972; publication of tables for the districts by 31 January 1973, each province by 30 June 1973, and total Agrostan by 31 December 1973.

2.61 Pretests.--FAO has called attention of countries to the importance of pilot censuses for testing questionnaires, concepts, enumeration procedures, and tabulating equipment. Agrostan will conduct a pretest of the forms and procedures to be used in the Provinces in January 1971. The tabulation of the results of the pretest will constitute a test of the tabulating equipment.

The materials and procedures for the Northern Territory will not be subject to a formal pretest because of the disproportionate amount of time and expense that would be involved. However, the district marshals will be asked to comment on the questionnaires and procedures and to try out the area measurement technique on a small number of holdings during their travels to various chiefdoms.

The pretests will enable the staff to examine the plan of operation with regard to such objectives as economy, accuracy, speed, and timeliness. Furthermore, the pretests can also be used for training officials and supervisory staff in different aspects of census taking.

2.62 Enumeration.--As discussed above (in sections 2.2 and 2.4), the enumeration in the Northern Territory is scheduled to be completed during November and December 1971. In the Provinces, the enumeration is to be completed in January and early February 1972; callback and problem cases would be completed in late February 1972.

2.63 Evaluation Survey.--An evaluation survey to measure the accuracy of the census results will be conducted on a limited number of holdings as soon as feasible after the main census enumeration is completed. The target date for the field work is set for April 1972.

The survey will be conducted only for the Provinces. Cost considerations and importance to the total census endeavor influenced the decision to limit the survey to the Provinces.

2.64 Publications.--Since the main purpose of a census is to obtain information and make it available to users, it is essential to let these users know when to expect the published reports. In the interest of economy, all of the data that are possible of publication cannot be provided for in the usual publication plan; however, the data that can reasonably be expected to be published will be in much demand. To forestall answering numerous requests for information as to when figures will be available, the NSO established a tentative time schedule.

As a general rule, the data will be made available, in preliminary form, as soon as the census results are tabulated and reviewed. Data for districts (assuming that data will be published at the district level--see section 4.11) should be available first, with the target date for completion set for 31 January 1973. Data for provinces should be available by 30 June 1973. Final publication with cross-classifications for Agrostan and its component provinces should be published between 1 July and 31 December 1973.

Timing of the reports for the Northern Territory is less rigid, although the target date for completion of the reports is 30 September 1973.

Results of the Evaluation Survey will be included in the final reports. Although the NSO has had no experience in an evaluation survey related to a census of agriculture, the staff expects that a reasonable amount of information from the survey can be presented in the census reports.

To make the most use of information collected in a census, it is hoped to make additional tabulations, at cost, for nongovernmental agencies. The scheduling of these tabulations will not be allowed to interfere with the scheduling of the regular census publications; however, requests should be made early in order to include them in the planning.

2.7 Scheduling of the intercensal program

A census program should not end with the decennial enumeration and the publication of the results. Rather, the census program should

include plans for current surveys which will (a) obtain data on specialized topics which were not included in the decennial census, (b) obtain data on selected topics enumerated in the census but in more detail than was possible in the decennial enumeration, and (c) update information for selected census items.

Information from the decennial census often provides the basis for selecting the sample for a current survey. For example, a survey concerned with tobacco plant disease could use the census results to select holders who report that they grew tobacco. As another example, a survey concerned with current estimates of wheat production would be based on holdings reporting wheat.

> ***Decision***: Agrostan will plan the census program to include not only the decennial enumeration but current programs as well. Specific planning for the current programs will get under way as soon as the content and scope of the decennial enumeration are determined.

A discussion of an intercensal program and a description of the plans being made for Agrostan are contained in Unit X of the case study.

3. SCOPE OF THE CENSUS OF AGRICULTURE

A census, conceivably, could be conducted by finding those households in which a member or members grow any crops or keep any livestock. The census inquiries could then be restricted to those items. While such data have value, they will be much more useful if they can be related to the size of the holdings, the tenure, utilization of the land, etc. Any land reform program worthy of its name must be acquainted with the structure of agriculture.

The National Government of Agrostan, in common with FAO, has recognized the importance of agricultural statistics in carrying out its programs to raise levels of nutrition, to improve methods of production of food and other agricultural products, to make available and facilitate distribution of supplies and materials needed in production, and in general to improve the conditions of the rural people. The FAO, in its suggested program for the 1970 World Census of Agriculture, outlined its proposals for measuring the structure of agriculture under 10 headings.[2]

At the same time, it was acknowledged that the primary purpose of an agricultural census should be to satisfy national needs. In fact, national needs are the major factors which should determine the content of a census. However, international uses of census data are important. Therefore, improvement in comparability of statistics, nation by nation, should be a secondary goal to be attained through the use of standard lists of census topics and uniform definitions, classifications, and tabulations.

The NSO of Agrostan, upon invitation, had been represented at a recent Regional Conference of Agricultural Statisticians, convened under the sponsorship of FAO, and to which representatives from Agrostan's neighbors had also been invited. The Conference dealt with common problems in the enumeration of agriculture and in the processing and publication of the data to assure reasonable comparability, country by country, and for the entire world. The regional group accepted, in principle, the guidelines set forth in the FAO manual.

3.1 Inclusion of Northern Territory

In the 1961 Sample Census of Agriculture, the Northern Territory was not represented. The omission of that region was thought to have had little effect on the published totals as being representative of the whole of Agrostan for most items such as crop areas, crop production, and livestock numbers. Being large as to total area, however, the omission of the Northern Territory had much effect on the percentage of Agrostan's area in agricultural holdings.

The crucial role of agriculture in the Northern Territory in economic development can no longer be overlooked. Great strides in additional production and improved cultural techniques

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[2] Food and Agriculture Organization of the United Nations. Program for the 1970 World Census of Agriculture. Rome, 1965.

seem to be taking place through gradual breaking-down of the tribal form of government and by the influx of small amounts of capital both from other parts of Agrostan and from foreign sources. Much of this new capital has been attracted by the possibilities of growing cotton and rice with irrigation and by the possibility of utilizing broad expanses of land for wheat and other cereals.

Any type of census in the Northern Territory, if it covers small holdings and tribal lands adequately, is expected to be relatively costly. Few of the small private holders or those associated with tribes are familiar with land measurement or with standard weights and measures; for these holdings, objective measurements must be used. Furthermore, because land is plentiful and the inhabitants are not wholly restricted to a certain area, the measurement will be limited to the cropland actually in use during the census year.

As for crop production, objective measurement would not be feasible for a census, largely because of the different harvest periods. However, most of the commercial production of the five principal crops--wheat, rice, cotton, coffee, and sisal--originates on the larger holdings. It is believed that production figures for these crops can be gotten by direct inquiry, not resorting to objective measurements.

> ***Decision***: The whole of Agrostan will be covered by the census. In the Northern Territory, measurement of land will be restricted to land used for crops during the census year and will be accomplished through objective measurement for the small holdings and direct inquiry for large holdings. Production figures will be obtained through direct inquiry and will be asked only for five principal crops.

The rising importance of the Northern Territory and its potential make it necessary to learn more of the nature and structure of the holdings.

3.2 Coverage of holdings in rural areas

Ideally (according to FAO recommendations), the census should include all agricultural holdings in a country, whatever their size, and whether located in rural or urban areas. Practical considerations, however, usually make it necessary to limit the enumeration to those holdings which are above certain lower limits as to size of holding, size of operation, or both.

No uniform minimum limits with respect to area, volume of output, number of livestock, number of trees, etc. are suggested by FAO. The established limits, from country to country, are expected to vary. But in view of the large number of small holdings in many countries and their considerable production of some important foods, FAO strongly recommends that the minimum limits be made as low as possible. One added reason seems to warrant a low minimum; namely, many of the families of small holders have little or no other source of income. If not covered in the census, it is not likely that their plight would be made known.

The 1961 Sample Census of Agriculture excluded holdings of less than 0.5 of a hectare. Further, there were no statistics from the 1960 Population Census to describe the characteristics of the holdings that were out-of-scope. However, a review of a sample of the Listing Books used in 1961 indicated that approximately 40,000 holdings in the 13 Provinces were out-of-scope through having less than the 0.5 minimum. It is believed that most of the excluded holdings were subsistence-type holdings.

The identification of an agricultural holding can be established in several ways. One method is to associate a holding with a household (or a household member). All of the land may or may not be in the same location as the dwelling in which the household lives. This method has several advantages. The respondent would be answering for his entire holding even though it may be fragmented. Moreover, he is likely to be available to the enumerator to supply the information for the questionnaire. On the other hand, this procedure may miss a few holdings that are associated with a dwelling which is vacant at the time of enumeration, although it is assumed that the land is under someone's charge and will be reported as his holding

even though he is not living on it.

Another method is to have the enumerator cover a designated area of land and account for the holdings represented by that land regardless of where the holder lives. This method has obvious disadvantages in that it is most difficult for the enumerator to keep track of land coverage within a specified area. Further, the land area to be covered might include only parts of some holdings, and the rules on when to enumerate and not enumerate the holding may not be followed consistently. Also, the holder may not live anywhere near the bulk of his land, and there would be the problem of finding a respondent.

> *Decision*: All holdings associated with any member of the household growing crops or keeping any livestock will be identified. In the Provinces, holdings of less than 1/10 of a hectare will be out-of-scope (unless the holding has "specialized" agricultural operations). In the Northern Territory, small holdings are not ruled out-of-scope.

By establishing these limits for Agrostan, it was thought that most families dependent wholly on what they produced on the holding will be accounted for. Moreover, the cost to enumerate the small holdings in a census is relatively small compared with the cost to make a separate survey if the results indicated a sizable number of holdings below a higher minimum.

In addition to holdings under 1/10 hectare (in the Provinces), it is assumed that the editing rules will consider out-of-scope those holdings that are above the minimum in area but with very little crop or livestock production.

3.3 *Coverage of holdings in urban areas*

In all cities of most countries, regardless of the size of the city, there are some persons who operate agricultural holdings, doing the work thereon with or without the aid of hired laborers. Some of these urban residents live on their holdings, which are entirely within the city limits. Others live in the city but go to their lands outside the city, as the need arises. They may or may not maintain a small garden and keep animals and poultry at their city residences.

No attempt was made in the 1961 Sample Census of Agriculture to enumerate agricultural holdings located within the boundaries of urban places. Likewise, no effort was made to locate agricultural holders (persons responsible for conducting agricultural operations) in the cities, regardless of the location of their lands.

Based on the experience of countries with socio-cultural practices similar to those which prevail in Agrostan, an estimated 6 to 8 percent of the agricultural holdings will have no chance of representation if cities are not included in a census of agriculture. This assumes that a holding is always associated with the holder; that is, the holder is located and all of his land enumerated regardless of where the lands are situated.

> *Decision*: Small urban places will be included in the census in the same manner as rural enumeration areas (EA's). Similarly, EA's along the edges of cities will be included as though they were rural EA's. In the remaining urban EA's, only holdings of 500 hectares or more or having certain specialized agricultural operations (National Certainty holdings, as defined later) will be included in the census.

To cover all holdings within the limits of urban places and all holders living in urban places but having their agricultural land outside the city would be disproportionately costly for Agrostan. The decision which the NSO adopted endeavors to include as many as possible at reasonable cost.

3.4 *FAO "Short" or "Expanded" List of items*

The FAO acknowledged that the exact form of the agricultural questionnaire will need to vary from country to country, in accordance with local conditions. Its recommendations as to inquiries, therefore, were divided into two lists. The Short List includes items for which data are desired from all countries, as these are considered to be of major importance in describing the world's agriculture. The Expanded List contains items which are primarily of regional importance and on which some countries may be able to collect information through a census. This latter list provides more detail on several items than is proposed in the Short List. Countries are urged to select

from the items in the Expanded List those that are most suitable to their conditions.

> ***Decision***: The Director accepted the general recommendations of FAO as to subject-matter content but directed his Working Group to accept the Short List of items as a guide and to adapt the inquiries to the needs of Agrostan. Items should be taken from the Expanded List if the Working Group could justify including them for Agrostan. Since the structure of agriculture in the Northern Territory is known to be somewhat different from that in the Provinces, the aim will be to have a shorter questionnaire but one that will be as comparable as possible with the Province questionnaire.

The NSO Working Group recognizes that its first duty is to supply useful data to its own country. At the same time, its leaders have accepted the obligation to make its statistics as comparable as possible with those of other countries in its own general region and also throughout the world. These requirements necessitate having the information for the Provinces and the Northern Territory as nearly comparable as possible so that a sizable amount of data will be available for the whole of Agrostan.

In developing the questionnaires for both the Provinces and the Northern Territory, a plan was conceived which should ensure, for the holdings chosen for the census, a report for every crop harvested and for every kind of animal or poultry kept. It is recognized that data for an item of very rare occurrence cannot always be revealed in the publications.

3.5 Agricultural information in the population census

The 1970 World Census of Agriculture, as proposed by FAO, includes in its scope information on employment in agriculture. The same topics can be investigated in the population census, by counting the persons working in agriculture. However, the population census does not always give a good account of the persons employed in agriculture, as the results depend largely on the time reference adopted for the census. Moreover, it is not always feasible for the population census to include information on holdings necessary to relate agricultural population data to the characteristics of the holdings with which they are associated.

The questionnaire for the 1970 Population and Housing Census of Agrostan will include both population and housing questions. The number of questions required for the combined census places a sufficient burden on both the enumerator and the respondent without adding concepts and inquiries concerning agriculture.

> ***Decision***: The population census will include an inquiry on the "usual occupation" of persons 12 years and over. In addition, the listing of all persons in the household will permit coding family groups and relating them to occupation of the head (or other household member). The population census will obtain no other information relating to agriculture, such as size, tenure, or type of holding; nor will it identify holdings considered out-of-scope for the agricultural census.
>
> The agricultural census will include a question on the number and ages of persons in the holder's household so that basic population information can be related to characteristics of the holding.

All things considered, the NSO felt that it would be better to include population items in the agriculture questionnaire, rather than depend on the population census to supply data to relate to holdings. Furthermore, since the population and agricultural censuses will be taken separately, and not close in time, there will be little possibility of matching information from the population census with information obtained in the agricultural census. A matching operation is most difficult and costly even when the two censuses are conducted concurrently or at a close time interval.

3.6 Scope of the Evaluation Survey

Subsequent studies may be undertaken to evaluate the data gathered in a census, especially to ascertain the nature and extent of response errors (nonsampling errors). The Working Group agreed that it would be desirable to incorporate in the census plans, provision for re-interviewing a small sample of holders to obtain a rough measure of the accuracy of a few census items (see also section 2.63). For budgetary reasons, and because an evaluation survey places a burden on the limited

professional staff, an evaluation survey will necessarily have to be limited in scope.

> ***Decision***: An evaluation survey will be made of a small sample of holdings in the Provinces. The subjects to be investigated will be limited to tenure, area under crops, and one or two additional items which the Agriculture Division staff may want to add as the census questionnaires are developed.

A decision as to the personnel that would be involved in the field work was postponed. The scope of the study and size of the sample will be worked out in more detail later. It was agreed that these decisions should be made within a month or two after the census questionnaire and sample design are determined.

4. DESIGN OF THE CENSUS OF AGRICULTURE

The term "census" is used in this case study to apply to an enumeration generally taken decennially or quinquennially and providing data for small areas. The term "survey" is applied to a sample enumeration generally providing only national data (and possibly a few major subdivisions).

A "census" need not be a complete enumeration of the population to be covered. A sample census may be substituted, provided the units for enumeration are adequately selected.

According to the FAO manual, "Program for the 1970 World Census of Agriculture", the suggested census enumeration should envisage, in principle, the collection of data directly from all individual holdings by complete enumeration. This procedure permits the presentation of practically all data for small geographic areas (usually administrative units) including phenomena which occur rather rarely. However, in some countries, complete enumeration may not be feasible and must be replaced by a sample census which should be scientifically selected. The efficient use of sampling methods requires a good knowledge of the sampling theory and skill in its application. A sample census must therefore be designed by someone who is thoroughly competent.

4.1 Complete or sample enumeration

According to the 1961 Sample Census of Agriculture, there were approximately 800,000 holdings in the 13 Provinces. An estimate for 1971, based on the projected rural population (see exhibit II-1-1), places the total number of holdings at around 950,000 for the Provinces and 75,000 for the Northern Territory.

To enumerate approximately a million holdings in the 1971 Census would be a huge undertaking. A sample enumeration would (a) reduce the time required to complete the census, (b) reduce the number of enumerators and supervisors, (c) make it possible to select better-qualified field staff and to give them more intensive training and supervision, and (d) provide the data faster and with greater accuracy. Fewer questionnaires would need to be printed, fewer edited and coded, and fewer tabulated. Thus, a sample census should also result in a smaller expenditure of money.

On the other hand, it is recognized that a sample census is likely to complicate the field procedures and the tabulation processes. Further, the final results are subject to sampling error.

The initial and only venture, heretofore, in the taking of a census of agriculture in Agrostan was the 1961 Sample Census of Agriculture. Thus, Agrostan, in common with many other developing nations, has not had much experience in taking a sample census. The 1961 enumeration, which excluded the Northern Territory, provided data at the Province and National level, but not at the district level.

> ***Decision***: The enumeration shall be conducted on a sample basis. The sample should be of sufficient size to permit publication of simple distributions of characteristics at the district level, and more detailed data at the Province and National level. For the Northern Territory, the sample should provide limited data for the three zones and more detailed data for the total Territory. The census shall be known as the "1971 Sample Census of Agriculture".

The general plan for selecting the sample, and an estimated number of holdings to be enumerated in the sample, must be included in the initial

planning decisions. Both decisions affect the size of the field staff that must be recruited and trained, the procedure for making assignments and supervising the enumeration, the allocation of money and personnel, etc.

4.11 Level of publication.--The Census and Statistics Act is explicit as to collecting data that will meet the needs of users. The National Statistical Council was relied upon to have knowledge of the uses to which census data can be put. The Council recommended that the sample be sufficient to permit publication of data at the district level. For the most part, simple distributions of characteristics should be published--as a working rule, no more than 6 to 8 classes for items that occur frequently. Data for the Provinces and total Agrostan should be more detailed. Data for the Northern Territory would be more limited, with figures for the three zones and the total.

4.12 Level of reliability.--The plan of the sample and its size are conditioned largely by the level of reliability that is desired in the statistics. Generally speaking, the larger the sample, the smaller the sampling error; and the smaller the sample, the larger the error (although factors other than size affect reliability).[3]

In consultation with users of agriculture data, the sampling technician recommended that, for statistics at the district level, the relative error should not be greater than about 5 percent (at the 95-percent confidence level) for characteristics that are associated with all holdings and 10 percent for characteristics associated with a large proportion of the holdings. At the province and national levels, it was felt that the relative error should be no more than about 5 percent for nearly all estimates.[3]

The requirements for the Northern Territory were deemed to be less rigid. It was felt that the relative error could be as large as 15 percent without affecting the usefulness of the data.

[3] See Unit IV of the case study for a complete discussion of sampling.

4.2 Size and design of the sample

It was recognized that precise figures and sampling procedures could not be provided until a specific plan could be worked out in detail.[4] Nevertheless, the sampling technician was asked to make a rough estimate of the sample size and describe the general plan of enumeration so that other planning aspects of the census could proceed.

In the 1961 Sample Census of Agriculture, every 20th enumeration area (as designated in the 1960 Census of Population) was selected for the agriculture sample, and all holdings in the EA were enumerated. Roughly 40,000 holdings were enumerated in the sample, averaging about 70 to 75 holdings per EA. Data were published at the national and province levels.

> ***Decision***: The 1971 sample will consist of an estimated 70,000 to 75,000 holdings in the Provinces and 1,500 to 2,000 in the Northern Territory.

For the 1971 sample, the sampling technician reviewed the 1960 population figures by EA (exhibit II-1-2) and concluded that the 1970 EA's (if similar to 1960) could be used as the primary sampling unit (PSU). Allowing for increases in population since 1960, the sampling technician estimated that the sample per district should consist of around 400 to 500 holdings; these would be distributed in roughly 20 PSU's, with an average of about 20 sample holdings in each. Thus, the total sample in the 13 Provinces would amount to approximately 70,000 to 75,000 holdings. The enumerators would list all the holdings in the sample PSU's (a total of roughly 300,000 listings) but fill an agriculture questionnaire for only a subsample of these holdings.

As in 1961, large holdings of 500 hectares or more would be included in the 1971 sample with certainty. However, the 1971 sample would add to this group all holdings with certain specialized agricultural operations regardless of the area in the holding; these would include holdings with large numbers of poultry or dairy cows, holdings

[4] See footnote 3.

producing silk fiber, and other holdings under 500 hectares but engaging in commercially important agricultural operations.

The sample in the Northern Territory would amount to 1,500 to 2,000 holdings to be enumerated (roughly 10,000 to be listed). National Certainty holdings would be defined the same as in the Provinces and a list compiled prior to enumeration.

4.3 Subsampling plan

As indicated, the enumerator will list all the holdings in a sample PSU and fill an agriculture questionnaire for a subsample of these holdings. Several methods could be used for selecting the subsample. The enumerator could be instructed to fill a questionnaire for every n^{th} holding that he lists; or the listing sheet could have predesignated sample line numbers.

Experience in many countries has shown that the enumerators are prone to introduce a bias in making the selection. He may believe that a given holding, on the designated sample line, is not at all representative of his PSU and he may seek to substitute one holding for another. Or the holding that falls on a sample line may be one for which the enumerator may have difficulty with the respondent, and the enumerator is tempted to rearrange the order of listing to avoid interviewing him.

> ***Decision***: The plan adopted for Agrostan will require that the district supervisor select the sample holdings after the enumerator has completed the listing of the PSU.

The NSO was aware that this procedure would be more costly, but felt it could not afford the biases that would probably result from having the enumerator select the sample.

The procedure for the Northern Territory will differ in one important respect, inasmuch as distances between sample PSU's will make it impractical and expensive for the supervisor to select the subsample of holdings for the agriculture questionnaire. The enumerator will list the holdings in the sample PSU and will select the sample for the agricultural questionnaires. Some stratification of the holdings, by number of cattle, sheep, or goats, will be introduced into the listing and sample selection to minimize the variance in the estimates.

5. DECISIONS ON OTHER MATTERS

The decisions discussed above are those which relate to the timing, scope, and design of the census. A few other matters for which early decisions are needed include method of inquiry, type of tabulating equipment that will be used, general plan for printing the data, and allocation of the budget to the various operational phases.

5.1 Method of inquiry

Information in an agricultural census may be collected in one of several ways, or in a combination of ways:

(1) Direct inquiry. Enumerators visit the holdings and interview the holders.

(2) Self-enumeration. Questionnaires are mailed or delivered to the holders, who will be asked to fill the forms and either return them to the designated office or give them to the enumerator when he calls.

(3) Objective measurement. For certain items, particularly land area in the holding and crop yields, information is obtained by actual measurement of the land or measurement of a sample of the crop yields.

Direct inquiry requires that the enumerator travel to the respondent in order to interview him. Where the literacy rate is not high, direct interview has the advantage that the enumerator can interpret the written questions and explain what information is wanted.

Self-enumeration can only be used where the literacy rate is high and where communications are reasonably good. Respondents who can read and understand the questions usually can provide more accurate information by filling the form themselves than by responding to questions that are read to them.

The method of objective measurement is quite costly. It requires intensive training of the enumerator and considerable time to carry out.

Furthermore, the measurement of crop yields must be scheduled precisely, since crops mature at various times of the year.

> ***Decision***: For Agrostan, all three methods will be used to some extent. The bulk of the enumeration will be by direct inquiry. Self-enumeration will be used for holders of National Certainty holdings in the Provinces. Objective measurement of cropland will be used for a sample of small holdings in the Northern Territory.

The decision to use direct enumeration was based primarily on the relatively low literacy rate of the rural population. Holders of National Certainty holdings will be asked to fill the questionnaires, but the enumerator will pick them up and, at the same time, review them for completeness and any questions the respondent may have. It was felt that the holders of large holdings would be capable of filling the form themselves; besides, they would have a better opportunity to consult their records and thereby provide more accurate information. Objective measurement of cropland in the Northern Territory, while costly, appeared to be the only way to obtain reasonably accurate information on area, considering that respondents in the Territory generally would not have much conception of land area measures.

5.2 Tabulation equipment

The type of tabulating equipment that will be used affects a number of operations in the course of the census. Among other things, a decision on equipment determines the design of the questionnaire and the way answers will be recorded, the extent of manual editing and coding, and the amount and arrangement of the tabulated data. The type of equipment affects also the number and type of employees to be hired, space for the equipment, and even the supplies that are purchased.

> ***Decision***: Plans for tabulating the data (and performing many of the edits) will assume that an intermediate-size computer will be used. However, the plans will be developed in such a way that the existing conventional equipment can be used if necessary.

The Agrostan NSO is negotiating for the purchase of a computer and is arranging for the training of programmers and operators. Because NSO's experience with computers is limited, plans for processing will provide for conventional equipment to be used if it appears that the computer programs will not be available.

5.3 Allocation of the budget

Usually some initial planning is necessary in order to arrive at a final cost estimate for the census. As soon as the total amount is known or is likely to be appropriated, the budget officers should apportion these funds to the separate phases of the census. A general reserve should be established so that the later phases are not jeopardized if a given sum is not sufficient for a specified phase of the work. Care must be taken to assure that there are funds remaining for the publication program, which is the ultimate aim of a census. A more complete discussion of the allocation of costs is given in chapter 2 of Unit II of the case study.

5.4 Other decisions

Many more decisions will be made as the census planning gets under way and the operations are worked out in detail. These decisions and the basis for making them are discussed in later chapters and units of the Agrostan case study.

Chapter II - 2. ADMINISTRATIVE REQUIREMENTS

1. *BACKGROUND DECISIONS*

Determining objectives and making initial decisions on the timing, scope, and design of the agriculture census are important prerequisites to the detailed planning of technical phases of the census, the determination of personnel requirements, the preparation of a detailed budget, etc. The decisions made by the NSO were based mainly on recommendations of the Working Group for the Agriculture Census which was established in January 1968, along with the Working Group for the Population and Housing Census, to organize the planning of the censuses. At the outset, one of the major considerations was to establish the timing. The two Working Groups jointly recommended that the Population and Housing Census would be taken as of 1 May 1970 and that the Agriculture Census would be taken later.

Since the population and housing census planning and preparation had first priority, the NSO staff did not actively engage in the initial planning on the scope and design of the agriculture census until the following year--January 1969. The major decisions relating to the agriculture census, along with the alternatives considered and the reasoning entering into the initial decisions, are discussed in the preceding chapter (II-1). A summary of the decisions is given below, as background for administrative matters.

1.1 Timing

To take advantage of 1970 Population Census data to establish an up-to-date population count as the basis for selecting a sample of primary sampling units (PSU's), the enumeration for the agriculture census could not follow too closely after the completion of the population and housing census. Moreover, the timing of the agriculture census enumeration should coincide with the end of a crop year. Therefore, it was decided that, for the Provinces of Agrostan, the agriculture census would start in January 1972; for the Northern Territory, plans are to start a little earlier (in mid-November 1971) to increase the likelihood of finding the operators who harvested a crop in 1971 still on the land they worked. The goal is to complete as much of the enumeration as possible in November and December 1971 in the Northern Territory and in January and early February 1972 in the Provinces, with clean-up enumeration to be completed as soon as possible thereafter.

The major census activities will begin with a pretest in the Northern Territory in November 1970 and in the Provinces in January 1971, one year before actual enumeration in both cases. There will be an evaluation survey of a small sample of holdings, in the Provinces only, in April-May 1972. Tables for the districts are scheduled for publication by 31 January 1973, for each province by 30 June 1973, and for total Agrostan by 31 December 1973. Tables for the Northern Territory are to be completed by September 1973. Special analytical reports on various subjects would be published during the first half of 1974.

The number of items on the questionnaire is to be limited, so that the average enumeration time will not exceed 35 minutes. However, where objective measurement of land area is carried out as part of the census, the total average enumeration time will be approximately 2 hours per holding.

It was also decided that planning of specific current programs, inaugurating an intercensal program to obtain needed agriculture data, will get under way as soon as the content and scope of the decennial censuses are determined.

1.2 Scope of the Census of Agriculture

The 1961 Census of Agriculture covered only the Provinces, as the omission of the Northern Territory was not considered to have significant effect at that time. However, because of the rising importance and potential of the Northern Territory, it was decided that the 1971 Census of Agriculture should cover all of Agrostan.

Small urban places (population less than 5,000) and areas along the edges of large cities (population of 5,000 or more) will be included along with rural enumeration areas (EA's). The remaining urban EA's will be excluded (except for any National Certainty holdings which may be located there).

It was decided to follow the general recommendations of the Food and Agriculture Organization of the United Nations (FAO) as to subject-matter content,[1] using the Short List of recommended items as a guide and adapting the inquiries to the needs of Agrostan. Inquiries on items from the FAO's Expanded List would be included only if justified for Agrostan by the Working Group. It was recognized that the questionnaire for the Northern Territory should be shorter than that for the Provinces, because of differences in settlement patterns and the structure of agriculture. Limiting inquiries on production to five principal crops and the objective measurement of land area in the Northern Territory are major differences in scope and procedures in the two parts of Agrostan.

1.3 Design of the Census of Agriculture

With emphasis on quality of enumeration in relation to time and cost considerations, it was decided that the agriculture census should be conducted on a sample basis and would be known as the 1971 Sample Census of Agriculture. However, the sample should be of sufficient size to permit publication of simple distributions of characteristics at the district level and more detailed data at the Province and National levels. In the Northern Territory, limited data would be published for the three zones and detailed data for the total Territory.

The enumeration plan calls for listing all the holdings in the sample PSU's and filling Agriculture Questionnaires for a subsample of the listings. According to rough estimates provided by the sampling technician, the workload in the Provinces will consist of listing approximately 300,000 holdings and filling Agriculture Questionnaires for about 75,000 of these. In addition, an estimated 3,500 National Certainty holdings (holdings of 500 hectares or more or having specialized agricultural operations) will be enumerated.

In the Northern Territory, an estimated 10,000 holdings will be listed; of these, approximately 1,500 to 2,000 holdings will be enumerated for the Agriculture Questionnaire. A subsample of the holdings (400 to 500) will be selected for objective measurement of crop area. All National Certainty holdings, defined in the same way as for the Provinces, would be included in the census.

There is an important difference in the subsampling plans decided on for the Provinces and for the Northern Territory. In the Provinces, the field supervisor must select the subsample of holdings to be enumerated, after an enumerator has completely listed a sample PSU. In the Northern Territory, because of great distances and difficulty of travel, the enumerator will list the sample PSU and select the subsample of holdings for enumeration.

1.31 Enumeration in the Provinces.--In the Provinces, one supervisor will normally have charge of the field work in one district; some of the larger districts, however, will require more than one supervisor. It is estimated that from 175 to 200 supervisors and 800 to 900 enumerators will be needed.

While there will be variations, each supervisor will be responsible for about 20 PSU's and

[1] Food and Agriculture Organization of the United Nations. Program for the 1970 World Census of Agriculture. Rome, 1965.

5 enumerators. An average enumerator assignment will consist of 4 PSU's. Enumerators will cover each PSU completely and list all holdings. The supervisor will visit the enumerator periodically to observe his enumeration and review his completed work. When the supervisor determines that a PSU is satisfactorily listed, he will then select the subsample of holdings to be enumerated on the Agriculture Questionnaire. The supervisor will also pick up the completed questionnaires and transmit them to the Province Census Office (PCO).

Initially, the supervisor will assign 2 PSU's to each enumerator to list in a designated order. At the time of his first visit, he will assign additional PSU's and designate the sequence of listing and enumeration provided the enumerator's work is satisfactory. Enumeration for the Agriculture Questionnaire cannot take place until the PSU is found to be satisfactorily listed and the supervisor has selected the subsample of holdings for the questionnaire.

On the average, a supervisor will also have approximately 20 National Certainty holdings to be enumerated. Questionnaires will be mailed to the holders in advance, with the request that the holders fill the form. Enumerators will visit the holdings to pick up the completed forms and review them.

1.32 Enumeration in the Northern Territory.--In the Northern Territory, 18 territorial districts will be set up in the three major zones of the Territory in preparation for the 1970 Census of Population and Housing. For the 1971 Census of Agriculture, 8 supervisory areas will be established--2 or 3 in each zone--and approximately 100 PSU's will be selected in the sample. A PSU will normally consist of one chiefdom. On the average, one supervisor will be responsible for about 13 PSU's and 4 enumerators. An average enumerator assignment will consist of about 3 PSU's.

Enumerators will cover each PSU completely, list all holdings, and select the subsample of holdings for enumeration on the Agriculture Questionnaire. They will also select a subsample of holdings for area measurement. The supervisor will visit each enumerator periodically to observe his enumeration, verify the sample selection, and review the enumerator's completed work.

On the average, a supervisor will have a listing of about 15 National Certainty holdings to assign for enumeration. Enumerators will visit the holdings to fill the questionnaires, as it will not be feasible to try to mail the forms in advance.

1.4 Other early decisions

Decisions regarding method of inquiry and tabulation plans were also required early in the planning in order to facilitate detailed planning and the preparation of budget estimates for the various operational phases of the census. Direct enumeration will be used to collect the bulk of the information, because of the low literacy rate of the rural population. As mentioned earlier, self-enumeration will be used in the Provinces for National Certainty holders who will be asked to fill their own questionnaires; enumerators will later visit the holding to pick up the forms and review them for completeness. Objective measurement of cropland will be used for a sample of small holdings in the Northern Territory. Although this is a costly method of obtaining information, it was believed necessary, since respondents in the Northern Territory generally would not have much conception of land area measures.

The decision to purchase an intermediate-size computer to process the census data was a major decision, and the NSO is making arrangements for the training of programmers and operators. Because of the NSO's limited experience with computers, however, plans for processing will be developed in such a way that the existing conventional equipment can be used, if necessary.

2. MAJOR ELEMENTS OF THE CENSUS PLAN AND TIME SCHEDULE

The careful and detailed planning of a census is a matter of prime importance in all countries,

and particularly so in countries with little statistical experience. A census is a complex, large-scale operation, even for a sample census. Plans and specifications must be drawn up early and accurately for each of the complex series of steps which make up a census operation. Everything needed for each step must be estimated in advance and made ready so that it will be carried out at the appropriate time and in the proper sequence. Such planning and preparation are essential for accomplishment of the basic objective of the census--obtaining as complete and accurate information as possible at a minimum cost in a minimum period of time. Even small oversights in planning can lead to serious defects and inefficiencies, particularly in the estimates of costs for large operations.

There is no fixed or uniform pattern for planning a census. The principles of census organization and administration must be adapted to the conditions of the country or area where the census will be taken. Census techniques will vary among countries, according to existing conditions. The enumeration will depend on the entire cultural framework of each country--its social and political philosophy, its economic and social development, and the educational background of its people.

The major elements of the agriculture census plan developed for Agrostan are described below.

2.1 Preliminary planning

The Working Group[2] became actively engaged in the considerations and preliminary planning required for the organization and administration of the agriculture census in January 1969 and functioned continuously through December 1969. Once the programs were actually started, it was expected that the group would be less active, although the members would be available for consultation on special problems and would meet periodically to review and assess overall progress. The Working Group had responsibility for planning the major activities described below.

2.11 Objectives and initial decisions.--In addition to determining what objectives are to be accomplished by an agriculture census and making the basic decisions on the timing, scope, and design of the census and the enumeration plan, the Working Group identified the main activities needed to implement the census program.[3] Specifications for these census activities, in terms of procedures and materials required, were planned by coordinated subcommittees of the Working Group. The detailed procedures and materials for each major activity are presented in subsequent units of the case study.

2.12 Assignment of specific responsibilities.--Once the main census activities were identified and specifications developed, responsibility for each activity was specifically assigned to one of the "Divisions" in the Department of Censuses and Surveys of the NSO, and in some cases to a specific "Section" in the Division. For example, the Agriculture Census Section of the Agriculture Division was assigned responsibility for determining concepts and content of the questionnaires, design of the questionnaire, preparation of table formats, and other subject-matter responsibilities. The Geography Division was given responsibility for preparation of maps for the PCO (TCO), for field supervisors, and for enumerators. The Field Operations Division was assigned responsibility for all field activities, including shipment of materials to and from the field. Similarly, other divisions and offices of the NSO were assigned specific responsibilities relating to the Census.

2.13 Preparation of budget estimates.--Late in 1968, in order to begin planning effectively, the Working Group found it necessary to prepare

[2]The Working Group for the Census of Agriculture comprised the Technical Adviser of the NSO; the sampling statistician; the Chiefs of the Agriculture Division, Field Operations Division, Geography Division, Machine Tabulation Division, and Publications Divisions; and three persons from the Ministry of Agriculture who were specialists in agronomy, animal husbandry, and land management.

[3]See chapter 3 of Unit I of the case study.

some preliminary estimates of the financial costs of the various operations required for the Census. These estimates, while tentative, were valuable guidelines for the Working Group in the development of census plans.

Most countries usually prepare their budgets to cover a government fiscal period of a year, or in some cases two years. For a statistical program such as a census, budgeting may be done on a project basis for the entire program, extending from the planning stages through collection, tabulation and analysis, to the publication of results. This type of budget is not limited to a single fiscal period but will extend over two or more such periods. The preliminary estimates for Agrostan's 1971 Census of Agriculture were in the form of a project budget of this type, covering fiscal years 1969 through 1974. Agrostan's fiscal year coincides with the calendar year.

Revision of the preliminary budget estimates was a continuous process during the initial planning period; final budget estimates for the census project were prepared in the second half of 1969. These are discussed in section 3 below.

2.14 Determination of policy in administrative matters.--In addition to planning the technical phases of the agriculture census, the Working Group was also faced with the necessity of determining broad policy and making decisions or recommendations in a number of administrative matters. These related to appointment of census officers and other temporary personnel, use of privately-owned printing and transportation facilities, violations of confidentiality, and the like.

In the personnel area, determinations were made regarding the number of temporary employees that would be needed both in the NSO and for field enumeration, how they would be recruited, how long they would be needed, their training and supervision, their rate of pay, and so on. Other administrative areas in which policy and procedure had to be determined include the payrolling system, and the transportation and communications systems.

2.2 Preparatory work

Not only must extensive planning for the agriculture census be carefully done in advance, but a whole series of preparatory operations must be undertaken in advance of the enumeration. Preparatory work involves the carrying out of the plans in preparation of the enumeration itself.

Preparatory operations will differ in number, magnitude, and complexity for different countries in accordance with such factors as the social composition and degree of literacy of the population, availability of means of communication and transportation, the topography of the country, pattern of settlement of the population, and availability of adequate personnel for all phases of the census. Since these preparatory operations are closely interrelated and follow a similar pattern and sequence, planners are usually faced with the task of accomplishing the overall and the detailed planning of census operations at the same time.

The preparatory work for Agrostan's Agriculture Census will start late in 1969, after assignment of responsibilities to various divisions and offices of the NSO. In planning a time schedule, it will be found that there is considerable overlapping for many activities, either because the types of work can be done at the same time, or because overlapping is essential to proper sequence of the work.

The preparatory work begins with establishing concepts for which statistics are to be collected and continues through the pretest operations. When the pretest has been completed and processed and the results analyzed, plans for the census itself will be reviewed and revised as necessary. It is estimated that these final preparations will get under way in about April 1971. The approximate time schedule for the major preparatory activities to be carried out in Agrostan is briefly described below.

2.21 Determination of concepts and questionnaire content.--The Agriculture Division is re-

sponsible for determining concepts and content for the census, for designing the questionnaire and other enumeration forms, and for interpreting the concepts in the questions that are asked and in the instructions to the enumerator. In these activities, the technicians will work closely with staff members in other divisions of the NSO to assure coordination and understanding of the various operational phases of the census; for example, they will work with the Field Operations Division and the Machine Tabulation Division to assure that the questionnaire is feasible for enumeration and that it can be processed efficiently.

The first materials produced will be used in the pretests. Preparatory work on concepts and questionnaires will begin in December 1969.

2.22 Design of tables.--Table formats and the tabulation plan will be designed by the Agriculture Division, concurrently with the development of the questionnaire. This is essential to assure that all items to be tabulated are included on the questionnaire.

2.23 Processing plan.--The processing plan is defined to include the procedures for checking in materials as they are received from the field, editing, coding, tabulating, and the posting or print out of the tabulated data in table form. Except for general overall consideration as to the kind of equipment that will be used, detailed planning for the processing operations will not start until the questionnaire is designed and the table formats are prepared. The planning should not wait for the final version of the questionnaire and tables, but should start as soon as a draft of the questionnaire is available. Decisions on editing and coding may alter the content and design of the questionnaires, and vice versa. For Agrostan, the plans will provide for processing by conventional equipment in case the computer programs are not completed or tested.

2.24 Training program and materials.--The planning of a training program and the preparation of all related materials for the field enumeration should begin early in the preparatory work for a census. The materials must be designed to provide uniform and effective training in required enumeration procedures within a short period of time. The materials needed are verbatim training guides for the training of enumerators, and training outlines or guides for the training of field supervisors and field office supervisory staff. Related training materials include practice exercises, workbooks, and filmstrips or other visual materials. Detailed instruction manuals must also be prepared for the use of enumerators and supervisors, and for the field office staff. Preparation of these materials should start when the general enumeration plan and concepts are being developed. Developing precise instructions often helps to clarify a concept or procedure and pinpoints deficiencies in question wording or format. Preparation of training materials should start about 1 April 1970, and the printing of the final version should be completed by 1 September 1971.

2.25 Pretest.--The exact plans and preparatory activities for a pretest, with regard to scope, design, timing and location, will be accomplished by the Agriculture Division jointly with the other divisions involved--Field Operations, Machine Tabulation, and Publications Divisions--during approximately the same period that questionnaires and table formats are being designed. Field enumeration for the pretests will be directed by the Field Operations Division of the NSO, since the temporary field offices for the census of agriculture will not have been established at the time of the pretest.

An informal pretest in the Northern Territory will be handled by District Marshals in November of 1970. A formal pretest in three of the Provinces will be conducted in January 1971, with NSO staff acting as supervisors; to simulate census conditions, local enumerators will be hired and trained in enumeration procedures.

The pretest design for processing calls for editing, coding, and tabulating of the pretest questionnaires for the Provinces, as a test of the tabulating equipment. This will require about 2

months--February and March 1971.

The NSO staff will carefully examine the pretest results in February and March 1971, to determine whether the procedures and forms tested should be adopted as the most economical, feasible, and productive of the desired results.

2.26 Review and revision of census plans.--A review of the overall census plan, time schedule, and budget estimates will be made by the members of the Working Group and the NSO staff in April 1971, based largely on information from the pretest.

The pretests will be mainly concerned with questionnaire format, question wording, and the overall effectiveness of the listing form; analysis of the pretest is expected to result mainly in changes in these forms. Nevertheless, as a by-product of the pretest, some revisions will likely be made in the overall census plan and budget estimates; for example, in the estimated number of questionnaires that enumerators can complete in a day or the estimated number of kilometers traveled per PSU.[4]

2.27 Printing of census forms.--Printing of the enumeration forms, instructions, and other enumeration materials should be carefully scheduled to permit distribution of supplies in time for the training of field supervisors. The volume of printed materials is estimated on the basis of the total number of cases to be enumerated, with a sufficient surplus to take care of spoilage, lost forms, training practice, and emergencies. The number to be printed should also take account of the number of enumerators, since each enumerator will need an ample supply.

Agrostan's census plan specifies that 110,000 Agriculture Questionnaires should be printed for the Provinces and 3,500 for the Northern Territory. The dates scheduled for printing of these forms, together with 5,000 Listing Books for the Provinces and 200 for the Northern Territory, include the period from 1 August 1971 through September 1971. Other forms and instructions are also scheduled for printing in this period; but for forms needed in smaller quantities, the time schedule is extended through October.

2.28 Publicity plans.--Preparation for a publicity campaign is an important pre-enumeration activity. In Agrostan, preparations will start simultaneously with the design of questionnaires and table formats in December 1969. Work is expected to continue through September 1971. One part of the campaign will be an educational program to obtain the interest and cooperation of the public. The second part of the publicity program consists of preparing materials to be used for recruitment purposes--posters, pamphlets, radio announcements, and the like (see the illustration in exhibit V-1-1, which is included as a reference exhibit in Unit II).

2.29 Compiling lists of National Certainty holdings.--Preparatory work for listing of National Certainty holdings extends from January 1971 through May 1971. This includes preparation of listing forms and instructions, and the preparation of lists of the large agricultural holdings that were enumerated in the Provinces in the 1961 Census of Agriculture. Arrangements will be made with the Ministry of Agriculture to provide the services of District Agricultural Agents in the Provinces and with the Territorial Governor to provide the services of the District Marshals in the Northern Territory to compile the listings during the period 1 July to 1 September 1971.

2.30 Scope and design of the Evaluation Survey.--The Working Group decided during the preliminary planning that an evaluation survey would

[4]Based on pretest figures for Agrostan, the estimate of the number of questionnaires which could be completed per day was changed from 4 to 5, resulting in a saving of approximately 4,000 man-days. On the other hand, according to kilometers traveled by pretest enumerators, the estimated distance that census enumerators would travel in and between PSU's was increased from 40 kilometers per PSU for listing and enumeration to 48 per PSU. This resulted in an increase of 28,000 kilometers for enumerator travel which was reflected in revised budget estimates for enumerator travel allowances per PSU. Travel allowances were originally estimated on the basis of records for the 1961 Census of Agriculture. A few other minor revisions were made in the census time schedule and budget estimates, but essentially the original plans were adhered to. Some revision in question wording and questionnaire format also resulted from the pretest experiences.

be taken in the Provinces in April-May 1972. Preparatory work, including decisions on the size and design of the sample and items to be investigated is to be accomplished between July 1970 and April 1971. At that time, after pretest results are reviewed and census plans revised, preparatory work will get under way on the design of the questionnaire and other forms, enumeration procedures, and preparation of enumeration instructions and training materials. The time schedule for this work, including printing of forms, extends to 1 February 1972.

2.3 Mapping

The Geography Division is responsible for constructing, acquiring, and updating maps needed for a census. Normally a map inventory is started 3 years before the census and map acquisition begins 2 years before the census. The work of delineating the EA's should start about 1 year before the census. In Agrostan, major efforts were made over a 3-year period to acquire and prepare the maps needed for the 1970 Census of Population and Housing.[5] The NSO plans to use the Population Census maps for the Agriculture Census. Therefore, a full-scale mapping program is unnecessary for the 1971 Census of Agriculture. Only about 1 year will be required for preparation of maps for the PSU's that fall in the sample for the Agriculture Census; this is relatively little time in comparison with that required for preparing maps for the Population Census. The preparation of maps for the Agriculture Census will start as soon as the sample PSU's are selected, so that they will be completed at least by the first of September 1971.

2.4 Sampling operations

One of the early decisions made by the Working Group was the decision to conduct a sample census rather than a complete enumeration. Furthermore, it was decided that the sample design should make use of preliminary 1970 Population Census counts for census EA's (enumeration areas established for the Population Census) to select the sample PSU's for the agriculture census.

Investigation of alternative sample plans is to be carried out fairly early in the program, starting in June 1970. Information used in such investigation will necessarily be the data from the 1961 Sample Census of Agriculture. Arrangements for obtaining 1970 preliminary population counts as quickly as possible are to be made with the Population Division. These counts will be posted by EA, district by district. As soon as the figures for a district are compiled, the sampling technician can proceed. It is estimated that the actual sample selection should start 1 September 1970 and be completed by 30 June 1971, to allow ample time for the Geography Division to complete the review and preparation of enumerator's and supervisor's maps for the sample PSU's.[6]

As the field enumeration progresses and Agriculture Questionnaires are received in the NSO, the sampling staff will have the responsibility for reviewing the field supervisor's selection of the sample cases for which Agriculture Questionnaires were to be filled. Adjustment in the sampling weight for individual cases, or possibly additional field work, may be required where the sampling technician determines that the improper sample selection was made.

A final responsibility of the sampling staff is the computation of sampling errors and the review of final tables for the purpose of advising the subject-matter specialists on the statistical significance of detailed tabulations and recommending where data cells might be combined. Statistical review of the final tables will not be completed until about July 1973. Review of the Special Reports from the Census will occupy the sampling staff until about April 1974.

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[5] See chapter 3 of Unit II of the case study for a detailed discussion on maps.

[6] Maps will be prepared on a flow basis as the sample PSU's are designated by the sampling technician.

2.5 *Field operations*

The term "field operations" applies to all activities relating to the field enumeration. This includes the preparatory activities which precede the start of enumeration, those activities which take place during enumeration, and activities during the close-out period.

2.51 Establishment of Provincial and Territorial Census Offices.--The census plan calls for the establishment of a temporary field organization to conduct the enumeration for the 1971 Sample Census of Agriculture. This organization will consist of a Province Census Office (PCO) in the capital of each of the 13 Provinces and a Territorial Census Office in the capital of the Northern Territory. The Field Operations Division will handle arrangements for space and furniture so that the Territorial Census Office (TCO) will open the week of 27 September to 2 October 1971, the week following the training of the Territorial Census Officer and his two assistants. The PCO's are scheduled to open the week of 1 to 6 November, the week following the training of Province Census Officers. Negotiations for space and rental or purchase of office furniture and equipment are scheduled to start on 1 June 1971 and be completed by the end of September or mid-October at the latest. Every effort will be made to obtain free space from local government or civic organizations. To the extent possible, government-owned furniture and equipment will be used in the temporary offices.

2.52 Shipment of materials to field offices.--Shipments of bulk supplies of materials such as questionnaires, instruction and training materials, personnel and payroll forms, and other administrative forms are to be forwarded to the TCO starting on 1 October and to the PCO's starting 1 November 1971. Priority will be given to the Northern Territory[7] where supervisors will be trained from 18 to 23 October 1971. Supervisors in the Provinces will be trained in preparatory duties on 22 and 23 November 1971. Supervisor's maps will be shipped in time for both training sessions.

Enumerator's assignment materials (PSU maps and listing books) will be shipped to the TCO for delivery to supervisors by truck, along with bulk supplies, prior to enumerator training from 8 to 11 November 1971.

Enumerator's assignment materials for the Provinces will be shipped to the PCO's for delivery by truck, along with bulk supplies, prior to enumerator training from 27 to 30 December 1971. Supervisors will be instructed to place enumerator's PSU envelopes, together with supplies of blank questionnaires, Problem Referral forms, and pencils in a portfolio for each enumerator. The portfolio, a cardboard folder, will serve as a writing surface for enumerators. Supervisors will have extra supplies of questionnaires to distribute to enumerators as needed.

The Agriculture Census Section of the Field Operations Division will follow a set schedule and established procedures in shipping supplies to each census office. This section will maintain records of all shipments by date, destination, type, and quantity of shipments. Receiving offices will be responsible for acknowledging receipt and checking on quantities and condition of shipments.

2.53 Recruitment.--The problem of recruiting adequate qualified field staff for temporary employment, which will assure an accurate enumeration, is a serious problem for countries with a high percentage of illiteracy. Adequate time must be allowed for recruitment of the best qualified persons at all levels so that the necessary staff will be available for each stage of the field operations. For the 1971 Sample Census of Agriculture in Agrostan, field staff will be recruited in the following order:

(1) Province and Territorial Census Officers. These persons should be trained and ready to assume their duties and responsibilities as soon as the field offices open. Recruitment of Province Census Officers, preferably from among local government officials or by temporary transfer from the Ministry of Agriculture, will start on 1 August 1971 and must be com-

[7] Enumeration in the Northern Territory precedes that in the Provinces.

pleted by the scheduled date for training (20 September 1971 in the Northern Territory and 25 October 1971 in the Provinces).

(2) Technical and administrative assistants. The office assistants should be recruited at about the same time as the Census Officers, since they will be working closely together on all aspects of field operations. In the Northern Territory, assistants will be trained with the Census Officers; in the Provinces, assistants will be trained during the second week following the training of the Census Officers.

(3) Clerical staff for the PCO and TCO. The clerical staff will be recruited by the administrative assistant. The clerks will be responsible for control of the flow of materials and other supplies, maintenance of personnel and payroll records, preparation of reports, and field-office editing of completed enumerator assignments. Clerks will be recruited and brought on duty gradually, during October 1971 in the Northern Territory and during November in the Provinces.

(4) District supervisors. One of the technical assistant's chief duties will be to recruit district supervisors, and this must be done immediately following his own training. In the Northern Territory, supervisors will be recruited during the first two weeks of October. Supervisors in the Provinces will be recruited during the week of 15 to 20 November 1971.

(5) Enumerators. As one of their preliminary duties, district supervisors will hire enumerators to conduct the field enumeration in their districts. In the Northern Territory, this is to be accomplished in the 2-week period from 25 October to 6 November 1971. In the Provinces, supervisors will perform their preliminary duties, including recruitment of enumerators, during the 2½-week period extending from 24 November to 10 December 1971.

2.54 Training.--Just as recruitment of field staff should follow a definite time schedule, so should the training of personnel at each level of staff. The training for a census necessarily must prepare large numbers of temporary employees, in a relatively short time, to collect the census information according to specific instructions. Training of the field supervisory staff is particularly important, inasmuch as the supervisors are usually required to train the enumerators to collect the information that is eventually processed and published. The time schedule for training the field personnel is presented below.

Provinces	1971
Province Census Officers	25-29 October
Technical and administrative assistants	8-12 November
Field supervisors (preliminary duties)	22-23 November
Field supervisors (technical training and supervisory duties)	13-17 December
Enumerators	27-30 December

Northern Territory	1971
Territorial Census Officer, technical and administrative assistants	20-24 September
Field supervisors (all duties)	18-23 October
Enumerators	8-11 November

No formal training sessions will be given for field office clerical staff; for the most part, they will receive on-the-job training. It is planned, however, to have the edit clerks who will review completed field work attend an enumerator training session.

2.55 Census enumeration.--Once enumerators are in the field working, close supervision and review of their work must be maintained throughout the entire census period. In Agrostan, field supervisors will begin visiting their enumerators on the first day of enumeration for the agriculture census and continue periodic visits to observe the enumerators on the job, to review completed listings and select the sample for enumeration, and to review completed Agriculture Questionnaires.

Also periodically during the enumeration, the technical assistant from the PCO (TCO) will visit supervisors to review their work and check on their progress in supervising the enumeration.

The period of enumeration and field supervision will extend for 5 weeks in the Northern Territory, 15 November to 18 December 1971. In the Provinces, it is estimated that the period of enumeration and supervision will extend over a 6-week period, 1 January to 15 February 1972, and possibly to the end of February.

2.56 Close-out operations.--When the bulk of the enumeration has been completed, a brief period will be scheduled for close-out operations for Agrostan's agricultural census. During this time, clean-up enumeration will be done in PSU's which were not satisfactorily completed, and the census offices will review the last of the completed questionnaires and transmit all completed work to the NSO. The offices will wind up all their administrative and payroll work, and terminate the clerical work as soon as possible, with the objective of closing the temporary offices by the end of the close-out period. Due to unforeseen circumstances, some offices may be open past the scheduled close-out date in order to complete all work. Close-out operations are scheduled in the Northern Territory for the period 20 to 24 December 1971. In the Provinces, the close-out operations are scheduled to take place from 1 to 11 March 1972.

2.57 Transmittal of completed work to the NSO.--As soon as the first completed PSU's are transmitted by field supervisors to the PCO's and TCO, review of work will start under the direction of the technical assistant. As soon as questionnaires for 4 or 5 PSU's from one district (averaging from 80 to 100 in total) have been reviewed and found to be satisfactory, they will be transmitted to the NSO as one "Work Unit" for editing and coding purposes. Work Units will be transmitted once each week to the NSO. Completed questionnaires for National Certainty holdings will be transmitted to the NSO on a weekly basis, without regard to the formation of work units. Enclosed with each box or bundle of Agriculture Questionnaires transmitted will be the related Listing Books and enumerator's maps and a copy of the Field Transmittal, Form A-102 (see reference exhibit V-2-16).

The PCO's and the TCO will also transmit progress reports, time and attendance records and payroll claims for office staff, problem referral forms, and other necessary communications. These will be transmitted to the NSO on a weekly basis. Transmittal of completed work should begin about the third week of enumeration (1 December 1971 in the Northern Territory; 15 January 1972 in the Provinces) and extend to the end of the close-out operations (24 December 1971 in the Northern Territory and 11 March 1972 in the Provinces).

2.6 Evaluation Survey enumeration

In order to provide some measure of the accuracy of the 1971 Sample Census of Agriculture, an evaluation survey will be conducted from 15 April to 15 May 1972, under the direct supervision of the NSO. An evaluation survey should be conducted at the earliest possible date after completion of a census; delay creates difficulty in recalling facts and produces less reliable results. While the evaluation will be limited to the Provinces only and to the investigation of a few specific items--number of holdings, total land in holdings, and the total land from which temporary crops were harvested or on which permanent crops were grown--other data may be obtained for purposes of analysis. Since a primary purpose of an evaluation program is to inform users about the limitations of the data, results of the Evaluation Survey will be included in the agriculture census publications.[8]

2.7 Editing and coding

The questionnaires received from the field represent the raw data which must be processed through several operations before desired census tabulations can be produced. The first of these processing operations, following receipt and check-in of materials, is the editing and coding operation. The general purpose of editing is to examine questionnaires to supply missing entries and correct inconsistencies. The general purpose of coding is to translate the questionnaire items into numerical codes suitable for transference to a punch card which will be used in the tabulations. For Agrostan, it is planned that only a very limited amount of editing and coding will be

[8] See chapter 6 of Unit V of the case study for additional discussion on the Evaluation Program.

accomplished manually (particularly so if the computer programs are available). The operation will begin when the first questionnaires are received and will continue at an increasing volume until about 1 August 1972--an estimated period of 6 months. It is also estimated that the peak workload will occur during the 3 months from 1 April 1972 through June 1972. Editing and coding of National Certainty holdings will receive special attention and generally will be given priority. Because of the small volume, the questionnaires for the Northern Territory will be processed as convenient but will not be given first priority.

As discussed in section 2.23 above, editing and coding procedures will be developed during the planning and preparatory stages and tried out on the pretest questionnaires. Editing and coding instructions, training questionnaires, and other supplemental materials must be prepared for training the relatively large number of temporary workers who will be required for the operation. Procedures and instructions will be modified as necessary when the questionnaires, table formats, and tabulation plans are finalized. The specific editing and coding procedures which are carried out in the Operations Subsection of the Agriculture Census Section of the Agriculture Division are discussed in detail in Unit VII of the case study.

2.8 Card punching and tabulating

After editing and coding, the remaining processing steps--card punching, tabulation, and preparation of tables--will be carried out by the Machine Tabulation Division. The card punching operation is scheduled to begin when the questionnaires for an entire district have been edited and coded. The purpose is to create a larger work unit for the punching and subsequent processing operations than was required in editing and coding and also to facilitate tabulation of data by districts. Since there may be some time lag before editing and coding of all PSU's for a district is complete, card punching is tentatively scheduled to begin about one month after the start of the editing and coding operation and continue through August 1972--a period of about 6 months.

Since Agrostan's processing plan calls for the use of a computer, the tabulations may be accomplished without any physical counting of cards and results may be automatically printed on sheets prepared in the form of the desired tables. However, the time schedule for processing will also provide for the separate steps required for conventional processing in case the computer is not available or the programs are not completed and tested. It is estimated that the tabulating operations will extend from 1 May 1972 through December 1972. As with the editing and coding, the questionnaires for the Northern Territory will be given lower priority than those for the Provinces.

The instructions for punching and tabulating and the various training materials for these operations will have been developed during the preparatory work for the census, extending over a period of about 8 months--from 1 May 1971 through December 1971.

2.9 Review and analysis of tabulated results

Review of the tabulations for reasonableness and consistency, and preparing an analysis of the results, will be functions of the professional staff in the Program and Analysis Subsection of the Agriculture Census Section, Agriculture Division. This will be done on a flow basis, as soon as complete districts have been tabulated, starting about 1 July 1972. The review will continue through August 1973 for the regularly scheduled census publications and through May 1974 for Special Reports.

2.10 Publication of reports

The overall objective of the census is to publish the results. To be of the greatest value to potential users, the data must be published as soon as possible, since usefulness diminishes with the passage of time. It is essential to set reasonable target dates for publication in advance and plan the processing and printing programs accordingly.

Even when results are produced by the tabulating machines in the form of tables, much work may be required before they are ready for reproduction. For example: titles, captions, stubs, headnotes, and footnotes may be needed; figures may have to be rearranged; some data may need to be suppressed and cells collapsed where the sample size is too small to give reliable results; maps, charts, or other illustrative materials may have to be prepared; and an explanatory or analytical text must be written. Time must be allowed for all of these details in setting the target dates for publication of final reports.

In Agrostan, some key figures from first runs of the tabulations will be issued periodically as preliminary reports. Final reports presenting data by districts, are to be completed by January 1973; final reports for individual Provinces are scheduled for publication by June 1973 and for total Provinces by December 1973. Reports for the Northern Territory are set for completion by September 1973.

2.11 Calendar of major census activities

A time schedule or calendar of census activities, set up in the form of a chart, is a valuable tool for indicating the time sequence of the various census activities and estimated duration of each. Another important use of such a calendar is to measure the progress of each stage of the operation by comparison with the estimated time schedule. Such comparisons may reveal either serious delays in the work or miscalculations, in which case the estimates will need to be revised. A calendar will clearly show the necessary overlapping of many activities, although usually there are three broad areas of operation which roughly fall in chronological order: (a) pre-enumeration, (b) enumeration, and (c) processing and publication.

A calendar should be prepared early in the planning stage, although it may be necessary to make some adjustment as the planning and actual census operations proceed. Moreover, a time schedule should allow for some unforeseen delays or underestimates at several key points in the program so that some operations will not constantly lag or run ahead of others. The calendar of census activities for the Provinces, based on the major elements of the census plan described above, is shown as exhibit II-2-1.

2.12 Development of an intercensal program

In setting up the objectives of the Census of Agriculture, the NSO and the National Statistical Council believed that it is important to consider the decennial census as part of a larger statistical program. Accordingly, they will incorporate in the overall census plan, cost and personnel estimates to develop and implement a current program of needed agriculture data. A small staff of subject-matter specialists in the Agriculture Surveys Section will be assigned to work initially on a part-time basis, starting about the time the Evaluation Survey is being designed in July 1970, to develop an intercensal program. This group will work on a part-time basis during the decennial census activities and on a full-time basis, starting about July 1973, as the census workload slackens.

3. BUDGETING

Since financial practices differ greatly among countries, it is not possible to describe a budget and cost control system that would be applicable to all. However, it should be emphasized that both planning and control of the various census operations are dependent on careful estimates of the cost of each. Even the smallest component of work must be recognized and included in the cost estimates. It is good policy to have persons with administrative or supervisory responsibility for carrying out an operation actually participate in estimating the budget for their operations.

Throughout the census period, the budget should be continuously reexamined and actual performance compared with the overall plan to detect inefficiencies and oversights. It is inevitable

that some items of cost will be overlooked or incorrectly estimated, and adjustments will need to be made. The budget should be flexible enough to permit the necessary revisions, but estimates should be made as realistically as possible so that the contingency reserve is kept as small as possible. It is desirable to include in the budget estimates a reserve fund to absorb cutbacks or to cover unforeseen emergencies so as to prevent drastic alterations of the census plan.

3.1 Elements of a census budget

A budget that is well prepared in detail will reflect a plan of operation, a time schedule, and workload estimates. Such detail may be indicated in the budget itself or be presented as an accompanying document. A plan of operation provides the goals toward which activities are directed; the time schedule incorporates the "when" into the plan and sets a series of deadlines by which certain activities are to be completed; and the workload estimates reflect "how much" has to be accomplished and the rate at which it should be carried out.

3.11 Detailed plan.--The census plan which is reflected in the budget should be prepared in considerable detail and estimates made for each step so that the total budget figure will be fairly accurate. For a summary view, however, the plan may be divided into five major phases; for each phase, control of the estimates will be accomplished largely through adherence to a predetermined time schedule and staffing pattern.

(1) Planning and preparatory work. This phase will include the determination of concepts and questionnaire content; preparation of table formats; preparation of training program and instruction materials for field operations; preparation of processing specifications; designing and conducting a pretest; printing of questionnaires and other forms; mapping; selection of sample PSU's; etc.

(2) Field enumeration. The budget for field enumeration should reflect costs of the pretest, establishment of temporary field offices, the recruitment and training of field staff, travel for field personnel, field office operations, field supervision, enumeration, and shipment of materials. Details should show the number and location of field offices; the number and type of employees needed by type of work, length of employment, and salary; general procedure for training, enumeration, and supervision, and field review of the data collected.

(3) Central office processing. Costs for processing would cover receipt and check-in of materials, editing and coding, card punching, tabulating, computation of sampling variances, and review of the tabulations. Details for budget estimates should show number and type of employees needed by type of work, length of employment, and salary; type of tabulating equipment that will be used; and general plan for the office operations.

(4) Analysis and publication. This phase includes the preparation of final tables; verbal analysis of the data; construction of analytical maps and charts; and the publication of preliminary releases and final reports. The number of tables, the number and type of reports to be published, and the method of reproduction and the type of printing equipment to be used are among the major considerations in determining costs.

(5) General administrative and miscellaneous services. This phase of the plan should cover overall direction of the census; salaries of the permanent administrative NSO staff; purchase or rental of equipment; supplies; budgeting, accounting, and cost control; general administration of the central NSO operations; informational services; transportation and communications; and miscellaneous administrative services. Details of the plan should show the estimated number of employees by salary and type of work; kinds and amounts of supplies needed, plan of communication and transportation; and types and cost of equipment needed. Purchase or rental of equipment (such as furniture, motor trucks, computers, printing equipment) can be charged to one of the specific operations or to the general administrative and miscellaneous services.

3.12 Time schedule.--The importance of setting up a well-planned time schedule in a census undertaking has been discussed in section 2 above. Adhering to the time schedule has a direct bearing on the budget. In an activity like the census, in which hundreds of employees are involved, a delay in meeting the time schedule may result in a considerable increase in costs. For example, a simple delay in shipping training materials may require that hundreds of enumerators be reassembled for training. Similarly, a delay in sending punch cards to tabulation may mean that machines and machine operators will be idle.

As with the allocation of funds, a time schedule should provide for some unforeseen emergencies and delays. Alternative plans at various points in the operations should be in readiness so that later activities are not hindered.

3.13 Workload estimates.--Although workload estimates could relate to several measurable elements, the term is usually applied to units of work or production; for example, the number of holdings to be listed, the number of cards to be punched, or the number of report pages to be printed. In preparing the budget for Agrostan, it is assumed that, for the Provinces, approximately 300,000 holdings will be listed and 70,000 to 75,000 Agriculture Questionnaires will be filled. For the Northern Territory, it is expected that roughly 10,000 holdings will be listed and 1,500 to 2,000 will have Agriculture Questionnaires filled for them; of these, about a fourth will be in the sample for area measurement.

The field enumeration workload will be the basis for estimating the workload for editing and coding also. For the punching operation, it will be assumed that the information on the listing forms will not be punched and that each Agriculture Questionnaire will require 8 to 10 punch cards. A very preliminary plan for the detailed tables to be published calls for 15 to 20 tables for individual districts, 75 to 100 for individual provinces, and about 50 for country totals. Tables for the Northern Territory are expected to be of about the same magnitude as for one Province.

3.2 Budget estimates for Agrostan

A budget for a statistical operation, or any other service of the government, should be prepared according to government regulations and in sufficient detail to facilitate review and consideration by officials who approve the programs and appropriate the necessary funds. The manner of presentation and adoption depends on the legislative custom and practice of the particular country. The Administrative Office of the NSO is to prepare formal budget estimates for Agrostan's agriculture census during July, August, and September 1969 for submission with the Ministry of Economy's budget to the National Legislature in October 1969. The estimates presented here for Agrostan's agriculture census must be regarded simply as guidelines for other countries. Each country must develop its own estimates based on the physical, social, and economic conditions existing in its own country. Estimates for Agrostan are summarized by number of man-years of work required for the census program, by personal services and other costs, and total costs by calendar years. Such summaries provide several control points which can be readily observed by the executive and administrative staff of the NSO.

3.21 Estimates of man-years.--In formulating Agrostan's budget estimates for the agriculture census, the estimated number of man-years that are required for each of the 5 major activities is determined, as shown in exhibit II-2-2. Estimates are derived from production records for previous censuses and workload estimates for the 1971 agriculture census.

3.22 Estimates for personal services and other costs.--Estimates are then made for total costs of personal services and other costs for the 5 major activities. These estimates (in percentages) are shown in exhibit II-2-3. Items entering into the preparation of these figures are workload estimates; prevailing wage and salary rates for all levels of employees (professional, administrative, and clerical staff, as well as field enumeration staff); map preparation; purchase or rental of equipment; rental of office space; communications; packing and distribution of enumeration materials; travel; training; printing; and other enumeration and processing supplies.

3.23 Estimates by calendar years.--Budget estimates are also broken down by total amounts allocated for each of the 5 major activities in each calendar year of the census period. This period extends from the beginning of actual planning in January 1969 through December 1973 when

the final census reports are scheduled to be issued (special reports by June 1974). The estimates by calendar years are presented in exhibit II-2-4.

3.3 Cost control

Government administrators have an obligation to exercise control over expenditure of public funds to assure efficient use of such funds. Various cost-control devices may be incorporated into a cost control system for a statistical organization. In order to determine the system which would be most practical and most suitable, many factors must be considered, such as the size of the organization, degree of centralization, the nature of the operations, and the degree of staff specialization.

As discussed above, a detailed plan of operation, a time schedule, and an estimate of workload are essential for cost control. They provide a means for measuring actual performance against estimated performance. They also provide the basis for delegation of supervisory authority and authority over expenditures.

Under the direction of the Administrative Office of the NSO, each division concerned with the agriculture census will receive an allocation of funds to cover its estimated needs for each fiscal period. Each division will maintain accounts in sufficient detail to show type of expenditure and the staff which incurred it. Variations from the plan and budget may be affected by external factors as well as by inefficient performance. In any case--whether over or under the budget--variations must be reported to management so that resources can be redistributed or operations curtailed.

3.4 Review and revision of budget

An effective cost control system must provide for continuous review of progress to insure that operations are proceeding according to plan and that cases of over-expenditure may be detected promptly. Since planning and scheduling are carried out months in advance of the actual operations, the replanning and rescheduling of work programs will be appropriate as more complete information becomes available.

Careful review of the operating and financial plan is essential before making any changes that would affect the project and subsequent operations. Changes in planning and scheduling may be necessary in advance of a fiscal period due to changed conditions such as increasing or decreasing trends in costs, different rate of progress in operations from that originally estimated, events affecting labor supply and demand, or inadequate planning.

All key planning and operating personnel must be informed regarding any changes so that necessary modifications may be made in staffing, time schedules, and personnel. Overall review and coordination of the changes in the plan are of great importance for a project as large as a census, which has many areas of dispersed responsibility.

Each important step in the operations should be analyzed in the light of the worst performance that could occur, and alternative actions should be planned to offset the effects of poor performance on any subsequent operations and funds. In addition, in order to prevent unnecessary drain on financial resources due to emergencies and unforeseen difficulties, consideration should be given during the planning stages to some or all of the following actions:

(1) Scheduling of all marginal activities toward the end of the census.

(2) Identification of special operations that can be shifted either forward or backward in the time schedule, in order to solve or minimize difficulties at critical points.

(3) Acceleration of work in key operations by supplementing the staff, use of overtime, and use of additional workshifts.

Excess expenditure for an operation should be reviewed not only for its effect on that particular operation but also for its effect on later stages of the program. For example, while excess expenditure in enumeration and processing may be small in proportion to the total expenditures in these stages, they could cause proportionately large

losses of statistical output in the publication stage, which makes up a much smaller proportion of the total cost. The publication of results--the last of the processing steps--is the ultimate aim of the census. Without publication of results, all other work and investment are lost.

4. *REPORTING SYSTEM*

In addition to controlling costs through periodic review of the census plan, time schedule, and budget, it is essential that periodic reports be submitted to appropriate officials to maintain control over the progress of the work, operations not yet started, costs, personnel, and special problems. For appraisal of results of the principal operations, reports must show cost and amount of work performed against the standards that were established. Reports should be brief, to the point, and frequent. Figures quickly supplied are most useful as a basis for effective and satisfactory control, even though some inaccuracies may be introduced because figures cannot be completely checked.

Reports should be submitted on a regular basis, and they should measure all the principal operations. For the less important parts of the program, they need not be compiled frequently; in fact, some may be needed only once or twice during the entire operation.

Reports should be prepared as economically as possible so that they will not delay operations or require a large staff to maintain them; this is particularly true for a one-time operation such as a census. Often, reports can be compiled from records regularly required for recording the movement of the work.

In general, reports should cover only selected control or strategic points. In any event, they should not be so elaborate or involved that they delay operations or result in increasing the cost of the operation itself. Such reports will reduce the time that would be required for administrative officials to pore over an endless series of operating figures, which in a high proportion of cases presumably would indicate satisfactory performance anyway. Brief reports covering all the important items will save considerable delay in pinpointing trouble spots.

Also, to be effective, reports must be analyzed promptly and be followed by corrective action when inefficient operations, unwarranted delays, over-expenditures, and other deviations from the overall plans are revealed. If prompt action is not taken, the situation may get out of hand; the longer the time lag, the more difficult it is to get to the real source of the trouble.

It was decided that several types of reports would be needed to maintain proper controls over Agrostan's agriculture census.

4.1 Report on major pre-enumeration activities

The reporting system should be put into effect as soon as the plan, time schedule, and budget estimates are determined. Because of the nature of many of the pre-enumeration activities, their status and work progress are difficult to measure. Consequently, much time, effort, and money can be wasted with serious effects, simply because the administrative and supervisory personnel are not aware of failures and delays. For this reason, status and progress must be reported in some form to the persons responsible for the job.

Activities such as determining census objectives, making initial decisions, developing census concepts, developing a processing plan, and similar operations do not have a definite beginning or end and it is not possible to measure them objectively. Determining questionnaire content and planning for publicity are other illustrations of preparatory work that cannot easily be measured in terms of precise work units. For some of these activities, a statement on the fractional part completed as of a specific date may be the only feasible method of reporting, and it would be well to impose either time limits or manpower limits to keep them from consuming undue proportions of the total resources available for the census program.

To the extent possible, nevertheless, each pre-enumeration activity should be broken into component parts for purposes of reporting and control. Records on the status of each part should be kept by the individual (or group) doing the work, and such records should be available for inspection by the supervisory staff. The records should be kept as simple as possible; however, the items of information that should be recorded will likely vary considerably according to the particular activity. The following report items for sample selection and mapping are illustrative of the type that might be incorporated in summary progress reports of a pre-enumeration activity.

SAMPLE SELECTION

Total number of districts (or groups of districts)

1970 Population EA counts:
- Received
- Posted to Sample Selection Sheet

Sample PSU's:
- Selected
- Sent to Geography Division for mapping

TABLE FORMATS

Series 100 tables:
- Subject guide prepared
- Draft of tables completed (date)
- First review (date)
- Final approval (date)
- Typed (number of tables)
- Set distributed to staff (date)

(Same for other series)

As noted earlier, the details of each activity would necessarily have to be itemized and a record kept on each. For example, in the sample selection operation, the detail record would show the date when the preliminary 1970 EA counts for each district are received by the sampling staff, who is responsible for the sample selection and the date he completes it, etc. The details on the preparation of the table formats would likely be quite extensive, showing various dates for consultation with specialists in subject matter or table design, processing specialists, and sampling technicians.

4.2 Report on recruitment progress

Reports will be needed by the NSO on progress in recruitment of the field staff (both the field office staff and the enumeration staff) to assure that a full contingent will be trained and ready to start the enumeration on time. If necessary, the NSO will take steps to obtain the needed personnel where reports indicate that recruitment is lagging. A telephone (or telegraph) reporting system will be established. After the Province and Territorial Census Officers and their assistants enter on duty in Agrostan, they will make reports on field recruitment each Friday to the Assistant for Field Operations. The report should give the number of clerks selected for duty in the office, the number of field supervisors selected, and the number still needed. After field supervisors enter on duty, the recruitment reports will relate largely to the number of enumerators selected.

In the Provinces, the field supervisors will telephone (or telegraph) the PCO from the District Offices of the Ministry of Economy each Thursday to report on enumerators selected and the number still needed. In the Northern Territory, field supervisors will report to the District Marshals, who will relay the information to the TCO by Thursday of each week. On the basis of these reports, the technical and administrative assistants in a PCO (TCO) may be instructed to help supervisors who are behind schedule with recruitment. In extreme cases, the NSO may decide to send personnel from the headquarters staff to assist supervisors.

4.3 Report on enumeration progress

Since enumeration is such a high proportion of the total cost of the census and has a considerable effect on the overall timing, it was decided that reports on field enumeration must be submitted weekly during the enumeration period. Field supervisors will submit reports to the PCO (TCO). These reports will be consolidated and submitted by the PCO's (TCO) to the Assistant for Field Operations in the NSO. A national summary of the enumeration progress will then be prepared each week by the NSO.

Field offices will be expected to take prompt corrective action with supervisors whose progress

indicates that they are behind schedule with the enumeration. The NSO, in turn, will be expected to take prompt corrective action in the case of PCO's or the TCO, if their weekly reports indicate that they are clearly behind schedule.

Field supervisors and the PCO's (TCO) will use the same form, Weekly Progress Report, Form A-104 (see reference exhibit V-2-18), to report enumeration progress.

Supervisors will prepare the form in duplicate as of Friday each week. The report will include such items as the total number of PSU's, the number of enumerators working, the number of PSU's assigned, the number of PSU's with listing completed, and the number of PSU's with Agriculture Questionnaires (A-1's) completed. Similar information will be reported for the National Certainty holdings. The supervisors' reports will be picked up at the time scheduled for weekly pick-up and delivery of materials in each district.

In each PCO (TCO), the administrative assistant will be responsible for consolidating the supervisors' reports for the report week, using the same form. However, since pick-up and delivery dates differ among districts and all supervisors' reports will not arrive at the same time, there will usually be a slight lag in the preparation of the PCO (TCO) progress report for a specific report week.

As the Weekly Progress Reports are received in the NSO, the totals for each province are posted or summarized on Form A-255, Report on Enumeration Progress (see exhibit II-2-5). Thus, for any given report week, enumeration progress will be known on a nationwide basis, as well as for each Province separately and each Zone in the Northern Territory.

4.4 Report on field costs

The Weekly Progress Report, Form A-104, provides for a report on field costs as well as on enumeration progress. Separate costs will be reported for enumeration, PCO (TCO) office salaries, and other expenditures. As with the enumeration progress, the PCO(TCO) will summarize field costs weekly, using pay authorization records, and will forward the report to the NSO. Figures for Provinces will be consolidated and summarized on Form A-256, Report on Field Costs (see exhibit II-2-6). The cost reports are to receive the same kind of attention and action by the PCO (TCO) and NSO staff as the enumeration progress reports.

4.5 Summary of enumeration, processing, and publication progress

As with the field enumeration, each major phase of processing in the central office of the NSO--from receipt and check-in of materials through publication of final reports--is a critical point over which controls must be maintained through periodic reporting. Each unit in the NSO responsible for a phase of processing or publication will be required to maintain records of the flow of work in and out of the unit; from these records, a summary progress report will be compiled to show nationwide figures on the status of all the census operations.

For Agrostan, the summary data on work progress will be posted to a chart each week (less frequent when various operations begin to phase out). The chart will provide the NSO officials with up-to-date quickly-grasped information on the progress of enumeration, processing, and publication. It will reveal critical points which can be traced to their source by investigating the detail report figures from which the summary statistics are compiled.

The summary progress chart for Agrostan is presented as exhibit II-2-7. It is planned to have only the one informal copy prepared and hung in the office of the Chief of the Agriculture Division.

Note that the "unit of reporting" will vary, depending on the type of activity. Furthermore, the unit selected should reflect an accurate measure of actual work done; for example, the number of PSU's for which enumeration is completed gives a more accurate report of the work status than the number of districts (since the workload in terms

of listing and filling questionnaires varies greatly among districts). For some steps, it is useful to report in more than one unit; for example, it is useful to know the number of PSU's for which punching is completed as well as the number of districts which are completed and ready for tabulation.

4.6 Summary of field and central NSO costs

A chart similar to the one on work progress, described above, will be prepared for census costs. Such a chart should show, as a minimum, summary figures for each major operational phase of the census program. It should show, in addition to the amount of money expended, the percentage of the budgeted estimate that has been spent to date for each operation (see Summary of Field and Central NSO Costs, exhibit II-2-8). The chart will quickly alert the NSO administrators to operations which are proceeding better or worse than was planned.

Statistics on the field costs that go into the summary are taken from the Report on Field Costs, Form A-256. Statistics on the central office operations are compiled from payroll records for each unit of employees in the NSO responsible for any operation connected with the census program. Such reports should be compiled with care, inasmuch as incorrect figures (whether too high or too low) can have serious effects on decisions that are made.

5. STAFFING AND TRAINING OF NSO TEMPORARY PERSONNEL

The development and implementation of a decennial census program requires an established statistical system with qualified personnel. Much thought should be given to the organization of the statistical office and plans for recruiting personnel, some of which will be hired on a temporary basis. Often, the matter of human resources is far more serious than financial resources.

5.1 Organizational changes in the NSO

In the early stages of planning for the 1971 Sample Census of Agriculture in Agrostan, it was decided that certain changes and additions in the NSO would be necessary to strengthen its organizational set-up for taking the agricultural census. The major organizational changes were described in Unit I of the case study (see also exhibit I-3-2, which is included as a reference exhibit in Unit II). More specific plans for organizational changes in the divisions and offices most directly affected are described below.

5.11 Agriculture Division.--When additional staff is recruited by the Agriculture Division for the preparatory work and processing the returns from the agricultural census, the division will be divided into two sections: (a) an Agriculture Census Section, which will have a fairly large staff, and (b) a Current Agriculture Surveys Section, which will have a fairly small staff. The latter will not be directly concerned with the census other than in the planning of the intercensal program of current surveys.

Within the Agriculture Census Section, a further subdivision of responsibilities will result; professional staff will be assigned to the Program and Analysis Subsection and clerical staff will be assigned to the Operations Subsection.

Most of the regular professional staff of the Agriculture Division will be assigned to the Program and Analysis Subsection to plan and prepare for the census and to review and analyze the results. Several subject-matter specialists from the Ministry of Agriculture and several statisticians from the Department of Economics in the NSO will be temporarily reassigned to this section for the duration of the census. A small staff of typists and clerks will also be assigned to this subsection.

The Operations Subsection will be made up of procedural specialists and clerks, and will be responsible for the preparation of materials to ship to the field, record keeping, receipt and control of returned questionnaires, editing and coding operations, and posting of tabulated data to table formats (to the extent not accomplished mechanically). The Operations Subsection will expand to

a large clerical staff for editing and coding of census returns when the peak workload reaches the NSO.

The editing and coding staff will be recruited locally in Calicut, generally on the basis of the formal education of the applicants since resources will not permit use of such techniques as intelligence and aptitude tests for employment of short duration.

Supervisory personnel for the actual editing and coding operation will be recruited during the first two weeks of December 1971 and trained during the last half of December. Recruitment of editing and coding clerks is scheduled for early January 1972. As the flow of questionnaires increases, additional clerks will be recruited and trained not later than February 1972. In general, recruitment and training of clerks must be scheduled so that there is adequate time for training but with no appreciable interval between the end of training and the beginning of the work.

A few supervisors and clerks will be especially trained on the editing and coding procedures for the National Certainty holdings, which generally will receive priority attention. Similarly, several clerks will be trained in the procedures for the Northern Territory as soon as there is a small backlog of questionnaires in the NSO.

5.12 Field Operations Division.--The Field Operations Division will expand its administrative and clerical staff at the NSO to meet the increased workload requirements for the 1970 Census programs. As a result, this division will undergo some internal organizational changes. It will also establish and direct a temporary field organization for the 1971 Census of Agriculture similar to that established for the 1970 Census of Population and Housing. At the NSO, the Assistant for Field Operations, who was appointed to the newly-created position for the 1970 Census Programs, will have overall responsibility for recruitment of field staff for the agriculture census and for serving as liaison between the Field Operations Division and the Agriculture Division.

Additional supervisory and clerical staff will be added to the Agriculture Census Section which has responsibility for field activities for the census of agriculture. Additional clerical staff will also be added to the Administrative Section to handle the added administrative functions relating to personnel and payrolls for the census. The other specialized sections of the Field Operations Division will not be affected by the agriculture census.

The major recruitment and training responsibilities of the Field Operations Division are related to the establishment of a field organization. A temporary Province Census Office (PCO) will be required in each of the 13 Provinces and one temporary Territorial Census Office (TCO) in the Northern Territory. Each of these offices will be headed by a Province (or Territorial) Census Officer. He will have two assistants--a Technical Assistant and an Administrative Assistant. Each office will also have a staff of several clerks and an enumeration staff. Field supervisors and enumerators will work out of their homes rather than an office, since they will be moving about much of the time. Information on the recruitment and training of the field staff is given in section 6 below.

5.13 Geography Division.--The Geography Division will have expanded its staff early in the preparatory stages of the 1970 Population and Housing Census in order to have adequate personnel to prepare the enumerator maps and other maps required for the decennial censuses. Some additional cartographers and a number of clerks will have been recruited. Only part of this expanded staff will be required to prepare the maps needed for the 1971 Sample Census of Agriculture, since much of the basic map work will already have been done (see chapter 3 of this unit for a full discussion of mapping).

5.14 Machine Tabulation Division.--The Machine Tabulation Division will expand its personnel considerably to handle the increased workload of processing the census data. An organizational change

will establish three sections (the Population and Housing Census Section, the Agriculture Census Section, and the Current Programs Section) to permit the necessary specialization of functions in the Division during the census period.

Some persons who worked on card punching and tabulation for the 1970 Population and Housing Census are expected to be available to work on the Agriculture Census also; however, recruitment of some additional persons will be required. As with editing and coding clerks, selection will be based chiefly on formal education.

5.15 Publications Division.--The Publications Division will expand its staff to handle the increased workload of publishing the 1970 Population and Housing Census reports; printing the questionnaires, instructions, and related forms needed for the agriculture census; and, finally, publishing the 1971 Agriculture Census reports. Plans are to use offset processes for the printing.

Additional personnel with typing and/or drafting skills will be recruited for the Publications Division but the Division's organizational structure will remain relatively unchanged.

5.16 Information Office.--The Information Office will increase its staff of writers and information specialists, initially to fulfill its responsibility for publicizing the 1970 Population and Housing Census. The staff will continue with preparing publicity materials for the 1971 Sample Census of Agriculture. The primary objective is to inform the rural population about the importance of the census and obtain their cooperation.

This office will also prepare materials needed for recruitment of field supervisors and enumerators for the census of agriculture, using all possible means of communication in order to reach every segment of the largely illiterate rural population. Various media which the Information Office will consider using include: radio and TV; microphone and loud speakers on jeeps, motorcycles, or trucks going from hamlet to hamlet; pictures and posters; messages sent home via school-age children; and, where appropriate, newspapers, leaflets, and circulars. Various Province and District Government offices, rural development organizations, and other public and private organizations will be asked to assist in the distribution of publicity materials in their communities.

5.2 Staffing needs and time schedule

Estimating staff needs is a major element in planning a census program. Staff needs should be assessed very carefully, since it is usually not possible to add qualified staff on short notice.

Each department, division, or section of the NSO that is involved in the census program should submit a report on its staff needs, indicating how many, what skills, what grade level, and when the persons would be needed. The requirements should be coordinated to assure that there are no gaps or duplications, and that a steady flow of work can be maintained. Some employees, particularly the semi-skilled, can usually be shifted from one job to another and thus minimize understaffing or overstaffing for a particular operation.

At the time the budget estimates were being prepared, the NSO estimated its staff needs for the entire census period. Types of skill and the time when the persons would be needed necessarily had to coincide with the time schedule and costs for a particular activity in the overall time schedule and budget (see exhibits II-2-1 to II-2-4).

The Agriculture Division, for example, estimated that it would need an additional four senior and five junior professional employees. Three of the senior technicians would be expert in crops, livestock, and land utilization, respectively; the other would serve as liaison with the processing specialists. The junior staff would assist in doing research on data needs; developing concepts, questionnaires, and table outlines; preparing training materials; and analyzing results and preparing final reports. Similarly, the Machine Tabulation Division estimated it would need 25 to 30 card punch operators and 4 or 5 supervisors for a period of about 6 months. The Working Group acted as coordinator to assist the divisions with their estimates and prepared a chart (similar to exhibit II-2-1) showing staff needs and timing.

5.3 Staff training

Educational requirements for various staff positions vary according to the particular level and type of skill that is needed. For example, statisticians are expected to have had university courses in mathematics and statistics, draftsmen would have completed courses in drafting, and typists would have learned typing skills probably at the secondary school level.

Although there is no clear distinction between education and training, the latter usually refers to the teaching of relatively specific applications of a skill. Training employees for a "census" operation is a very specialized function. For the most part, the learning and the application are acquired on the job.

In Agrostan, the semi-skilled employees will learn by doing. An editing and coding clerk will be given questionnaires to edit and code; an experienced person will review his work, point out errors, and continue to check the work until he is assured that the coder understands the procedure. The training period will be shortened in several ways: (a) by giving the trainees some background in how the Agriculture Questionnaire is to be filled, using excerpts from the enumerator's training guides, (b) showing selected examples of properly coded questionnaires, and (c) prompt follow up of the trainee's first assignments. In some phases of the work, the clerks will be trained in groups.

As with the editing and coding clerks, persons hired for card punching and tabulating are likely to be inexperienced in census work and must be taught first how to use the equipment--either by senior officials or by the manufacturers of the equipment. This preliminary training will provide an opportunity for selecting the most promising trainees for supervisory positions. If a computer is used, the operators and program writers will require technical training extending over a relatively long period.

The professional employees of the NSO will be trained by working closely with the senior staff. The trainees will be given a background in census operations, with emphasis on their particular area of concern. Conferences with question-answer periods will be directed by a specialist on the senior staff. Experiences in previous censuses and latest developments internationally will be discussed. For the top-level positions, the only training available may be self-training and guides established by the Food and Agriculture Organization of the United Nations.

As far as supervisory staff is concerned, it is planned to have some of the permanent employees advise the incumbents on techniques of supervision and management of employees, including how to detect weak spots and remedy them. The trainers for this activity will be staff members who have been successful in supervisory positions in the NSO; they will not necessarily be experts in the field of agriculture.

5.4 Staffing policy

In countries which have or desire to have a continuing statistical program, a qualified experienced staff is a valuable asset. During a decennial census, it is necessary to hire a relatively large number of temporary employees. By the time of the next census, the temporary staff will have found other jobs, and the benefit of their census experiences, for the most part, is lost. For the 1971 Sample Census of Agriculture, the NSO of Agrostan hopes to utilize some of the 1970 Population and Housing Census staff. Moreover, plans for an intercensal program to collect statistics on agriculture will make it possible to retain a nucleus staff of persons who will have experience in census programs.

Other policy guidelines of the NSO with regard to staff will be the use of the merit system for the appointment of statistical personnel and promotion to higher-level jobs. Other things being equal, preference for higher-grade jobs will be given to qualified personnel already on the NSO staff. Moreover, the NSO will encourage its professional staff to participate in outside activities which will add to their knowledge, experience,

or prestige; for example, teaching a course at a university, participating in research projects, contributing articles or reports to statistical journals, and the like.

A final policy guideline which the NSO considers important will be to encourage its staff to be as objective as possible in presenting and interpreting statistical data. The statistics are not to be intentionally biased or interpreted so as to support a previously established policy or to mislead the user. The role of the NSO will be a purely fact-finding activity.

6. *RECRUITMENT AND TRAINING OF FIELD PERSONNEL*

The method of recruitment of field personnel will vary according to the level of the employees. Similarly, training programs will be tailored to the duties and responsibilities of the job.

6.1 Office staff

The field office staff refers to employees who will work in the Province Census Office (or the Territorial Census Office). Their appointments for the agriculture census assignments will be on a temporary basis.

6.11 Census officers.--The Assistant for Field Operations at the NSO will be directly responsible for recruiting the Province and Territorial Census Officers. He will negotiate with the Ministry of Agriculture to transfer qualified employees from the local Ministry of Agriculture Province Office to these positions for the duration of the field work. Qualified candidates should be knowledgeable about agriculture, have had executive or administrative experience, some experience in dealing with the public, and preferably some experience in data-collection operations. Persons who held comparable positions for the 1970 Census of Population and Housing and who are available for work on the agriculture census will also be considered as qualified candidates.

If necessary, the Assistant for Field Operations will also negotiate with other Ministry province offices or with the provincial and territorial governors for the transfer of a qualified local government official to serve as census officer. In cases where a government employee cannot be made available, he will ask local officials for recommendations of local candidates from outside the government who are respected and responsible citizens of the community. Final selection of census officers must be approved by the Chief of the Field Operations Division and the Technical Adviser of the NSO.

Training for Province and Territorial Census Officers will be given in Calicut for 5 days by the top staff of the Agriculture Division and the Field Operations Division. Their training will cover the broad technical aspects of the census and the responsibilities of employees under their direction. Emphasis will be given, however, to their administrative responsibilities, including the overall supervision of the office; arrangements for publicity programs; compliance with time schedules for recruitment, training, completion of work, pick-up and delivery of completed forms, and review of work; maintenance of personnel and pay records; control and distribution of materials and progress and cost reporting. Census officers will be advised to attend training classes for field supervisors later to become informed on detailed enumeration procedures.

The 13 Province Census Officers will be trained in one group. The Territorial Census Officer and his technical and administrative assistants will be trained together a few weeks earlier, in order to meet the earlier starting date for the census in the Northern Territory.

6.12 Technical and administrative assistants.--The Assistant for Field Operations will also recruit the technical and administrative assistants from generally the same sources as used for the census officers. He will make every effort to obtain the temporary transfer of local Ministry of Agriculture employees to the technical assistant positions, since knowledge of agriculture and data-collection operations are "must" requirements for

persons in these positions. While these same qualifications are also desirable for administrative assistants, the most important requirements for candidates for these positions are administrative ability and experience. A number of the administrative assistants will probably be temporarily assigned from the province offices of the Ministry of Economy.

For the TCO, the Assistant for Field Operations will negotiate with the Territorial Governor for the temporary assignment of qualified persons from the governor's Staff for Ministry affairs to fill the positions of technical and administrative assistants.

If temporary assignments of government employees cannot be arranged, local persons who held positions comparable to those of technical and administrative assistants during the 1970 Census of Population and Housing and who are available to work on the agriculture census will be encouraged to apply for the job. Local persons with standing in the community, who are recommended by local government officials, will also be given consideration.

Joint training sessions will be held at two locations for technical and administrative assistants for the Provinces--one in Calicut and one in Ancash city. The assistants will be trained together for 2 days on overall aspects and responsibilities and separately for 3 days on their specialized responsibilities. Areas in which they will receive the same training include: recruitment procedures, pay procedures, receipt and control of materials, the pick-up and delivery system, and review of work.

Specialized training for technical assistants will mainly cover detailed enumeration procedures, supervisors' responsibilities, training of supervisors, and maintenance of an acceptable quality of supervision through review and observation of supervisors' work. Specialized training for administrative assistants will mainly cover clerical operations in the PCO (TCO), including maintenance of payroll registers, maintenance of employment records, preparation of progress and cost reports, control of supplies, distribution of materials, and participation in the publicity programs.

The training program for technical and administrative assistants[9] will be conducted by NSO officials for the most part, but census officers will be expected to participate by giving some portions of the training.

6.13 Clerical staff.--The administrative assistant will recruit a staff of from 6 to 10 clerks for the PCO (TCO) from among local residents in the Province capital. Announcements regarding the positions available will be published in the local newspapers and broadcast over the radio. Recommendations will also be sought from the local government and civic organizations.

Selection will be made by the administrative assistant on the basis of an interview with the applicant and the education and experience of the applicant as stated in his Application and Personnel Form for Temporary Field Service, Form A-200 (see exhibit V-1-2, which is included as a reference exhibit in Unit II).

Each office will have at least one control clerk, one payroll clerk, several edit clerks, and one or two persons with typing skills. Larger clerical staffs will be authorized for PCO's with heavy workloads. The administrative assistant will give on-the-job training to the clerks. Although clerks will have a special responsibility, they will be expected to work interchangeably on other operations, as the flow of work requires. Clerks will also be expected to study the parts of the Manual for the Province Office (or the Manual for the Territorial Office) which relate to their duties. Edit clerks who will review completed work will be required to attend an enumerator training session so that they will be familiar with enumeration forms and procedures. Edit clerks will also be used as substitute enumerators in emergencies.

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[9] Refer to the Manual for the Province Office (exhibit V-5-1) and the Manual for the Territorial Office (exhibit V-5-2), presented in Part B of Unit V of the case study.

6.2 Field supervisors

The technical assistant, possibly with help from the administrative assistant, will recruit field supervisors. Usually there will be one for each district in the Province, although some districts may require more than one supervisor. It is estimated that around 175 supervisors will be needed in the Provinces and 8 or 9 in the Northern Territory.

6.21 Recruitment.--The need for applicants will be publicized locally within districts by an-announcements in the local newspapers or by radio, by leaflets (describing the job) to be distributed to District Offices of the Ministry of Economy, and by poster announcements displayed on government and public buildings. District government officials and civic and religious leaders will also be asked for recommendations. Efforts will be made to have local authorities release teachers from their regular duties to serve as district supervisors, to the extent possible. In the Northern Territory, District Marshals will be asked for recommendations for the position of district supervisor.

To be qualified for the position of district supervisor, an applicant must have some knowledge of the agriculture in the area and be able to provide his own means of transportation, such as a motorcycle, a jeep, or even a horse, since he will be required to travel considerable distances. The technical assistant will make his selection on the basis of an interview with the applicant, his education and experience as shown on his application form, and strong recommendations from local officials. Preference will be given to applicants with previous experience as field supervisors or enumerators for the 1970 Census of Population and Housing, if they also have the necessary agricultural background and the means of transportation.

6.22 Training.--District supervisors will be trained by the technical assistant at the Province Census Office (Territorial Census Office). All training of supervisors in the Northern Territory will be given in one training session. Training for district supervisors in the Provinces will be given in two stages. The first stage will last 2 days and will cover the supervisor's preliminary duties of (a) inspecting their districts, (b) spotting the location of National Certainty holdings on their maps, (c) checking PSU boundaries, and (d) subdividing large PSU's, when necessary for sampling purposes. In addition, they will be trained on how to recruit, test, and select enumerators; how to obtain testing and training sites; and how to prepare the Pay Authorization Form A-105 (see exhibit V-2-19, which is included as a reference exhibit in Unit II). Supervisors will have approximately $2\frac{1}{2}$ weeks to perform their preliminary duties and then must return to the PCO for 5 days of technical training.

For the second stage of the supervisor's training, the technical assistant will give them the enumerator training using the same verbatim training guide that supervisors will use in training enumerators, including practice enumeration in the field. In addition, supervisors will be trained on their supervisory responsibilities of conducting training; preparing personnel forms; reviewing and observing the enumerator's work; selecting the sample of holdings to be enumerated on questionnaires; issuing pay authorizations for enumerators; transmitting completed work and other forms to the PCO; maintaining their Field Supervisor's Record Book, Form A-103;[10] and preparing weekly progress reports. A verbatim training guide[11] will also be used for this portion of the supervisors' training.

6.3 Enumerators

A staff of from 800 to 900 enumerators in the Provinces and about 35 enumerators in the Northern Territory will be recruited by district supervisors. In the Provinces, a supervisor will train and direct the work of five enumerators on

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[10] See exhibit V-2-17 in Unit V of the case study.
[11] See outline of the guide in exhibit V-4-3 and a portion of the guide in exhibit V-4-4 in Unit V of the case study.

the average; in the Northern Territory, each supervisor will train and supervise four enumerators on the average.

6.31 Recruitment.--A district supervisor will make every effort to recruit qualified enumerators living within his district. However, if a better qualified candidate can be found outside the district, location of residence should be a secondary consideration, but familiarity with agriculture in that area would still be required.

While inspecting their districts following their preliminary training, supervisors will contact subdistrict magistrates and local school and religious authorities to enlist their aid in urging qualified candidates to apply for the position of enumerator. At the same time, supervisors will make arrangements for the use of school rooms, community halls, or other available space as a temporary office for testing of enumerator applicants in the district; such arrangements would be made in two or three locations so as to minimize the distance that applicants will have to travel. Once a place and date for testing have been set, the supervisors will then post announcements in the area (see the example of a recruitment announcement in exhibit V-1-1, which is included as a reference exhibit in Unit II), specifying when and where to apply for the job of census taker. Similar announcements will be made by radio and newspaper in the area, if available.

When enumerator applicants arrive at the testing center, the supervisor will administer the Enumerator Selection Aid, Form A-201 (see exhibit V-1-3, included as a reference exhibit in Unit II), to determine the applicants' ability to read maps, to do some arithmetic computations, and to read with comprehension. Applicants will be allowed 90 minutes for the test. As soon as tests are completed, the supervisor will grade them, using the Answer Key to Enumerator Selection Aid, Form A-202 (see exhibit V-1-4, included as a reference exhibit in Unit II). While the test is being graded, the applicants would be asked to fill Form A-200, Application and Personnel Form for Temporary Field Service (see exhibit V-1-2, included as a reference exhibit in Unit II).

To be eligible for selection, applicants must make at least the specified minimum score on the test and must also be eligible on the basis of the entries on the application and a brief interview. If several candidates appear to be qualified, the supervisor should try to select the best qualified in the group, in terms of having a pleasing personality and ability to deal with the public tactfully.

If the supervisor decides to select an applicant at the testing site, he should give him a Notice of Training, Form A-107 (see exhibit V-1-1, included as a reference exhibit in Unit II), provided the date and place of training are known. If not, the notice must be mailed to the enumerator early enough for him to arrange to attend the training session.

6.32 Training.--District supervisors are responsible for training their own enumerators, but two or three supervisors from adjacent districts may team together to hold a joint training session, as long as the number of enumerators to be trained is 20 or fewer and as long as travel to a central training site is not an unreasonable distance. In team training, each supervisor will present specified portions of the training from the verbatim training guide and serve as assistant to the trainer the remaining time. When team training is used, the supervisor whose district is the most centrally located should be made responsible for obtaining suitable training space. In addition, he will also have to make arrangements for lodging for all those attending the 4-day enumerator training session. Supervisors who are not part of a training team will be responsible for obtaining their own training space and arrangements should be made at the same time they are arranging for testing space.

The technical assistant will give special instructions and guidance to supervisors on whom to contact within their districts for testing space or training space and on what constitutes suitable

space. The technical assistant may already have made some contacts by the time he instructs supervisors on their preliminary duties.

A verbatim training guide[12] will be provided for the supervisor's use in conducting training. This will assure complete and uniform coverage of all enumeration procedures, including detailed study of the questionnaire items. Practice interviews will be given in the classroom to provide familiarity with the questionnaire and real practice interviewing in the field will be conducted in areas near the training center (but not in any sample PSU's). The enumerators will go in pairs, so that each will have an opportunity to practice and also to observe and help one another to correct their mistakes. The supervisor will observe each enumerator during the field practice. From this observation, he will be able to determine which enumerators may require some additional training, which are the weakest and should be observed first, and which are incapable of becoming good enumerators and should be replaced.

An important feature of enumerator training will be the Enumerator's Workbook[13], which will contain exercises and problems relating to the material covered in training. To provice a change of pace in training as well as an opportunity to apply the instructions given, enumerators will be assigned workbook exercises periodically throughout their training.

Training of enumerators in the Northern Territory will be similar to the training in the Provinces except that each supervisor will train his own enumerators. Because of great distances, it will not be feasible to hold joint sessions.

Enumerator training in the Northern Territory will be adapted to the differences in the questionnaire for the Northern Territory. Also, since enumerators, rather than supervisors, will select the sample of holdings for enumeration and will also carry out area measurements, enumerator training in the Northern Territory will give emphasis to these techniques.

7. PAY SYSTEM

Many factors, in addition to prevailing wage rates for comparable work, enter into the establishment of a prompt and equitable pay system for the large staff of temporary workers required for a huge statistical operation such as a nationwide census. Factors which must be considered for field workers are training time, size of workload, length of employment, travel required, and difficulty of terrain that must be covered. Other factors will be considered, however, in determining the remuneration of the clerical staff which will work on the preliminary and processing operations, since they will be employed for a longer period of time, will require a different type of skill, and will not be required to travel.

For Agrostan's agriculture census, it was decided that it will be necessary to pay the field supervisors and enumerators in cash because of the lack of facilities in rural areas for cashing checks. It was also decided that supervisors and enumerators would need to be paid promptly and frequently. It was recognized that persons living in rural areas would generally find it a great hardship to have to wait for their pay until after their assignments were completed.

The office staff in the temporary field offices and the temporary clerical staff working on the processing operations at the NSO will be paid by check at regular pay period intervals, since they would have access to check-cashing facilities in the cities where they worked. Pay period intervals for the temporary field office staff, however, would differ from those for NSO employees. Differences in the pay system are described below.

7.1 NSO

Both regular and temporary NSO employees will be paid by check at the end of each 2-week

[12] A portion of this guide is shown in exhibit V-3-4 in Unit V of the case study.
[13] A portion of the Enumerator's Workbook is shown in exhibit V-3-5 in Unit V of the case study.

pay period. Time and attendance records for each employee will be maintained within each supervisory unit of the divisions and offices within the NSO and turned over to the Finance Section of the Administrative Office at the end of each pay period for processing. Checks will be issued every two weeks by the Finance Department of the Ministry of Economy.

7.2 Field office staff

Both the supervisory and clerical staff of the PCO's and TCO will be paid by check, since the offices are located in the capital cities where cashing checks presents no problem. However, because the staff is temporary and will be employed for only a short time. they will be paid on the basis of a weekly pay period.

Similar to the NSO system, time and attendance records will be maintained for each employee by the payroll clerk. The records will be reviewed and certified at the end of each week by the Administrative Assistant and then forwarded to the Administrative Section of the Field Operations Division for processing. Checks will be issued by the Finance Department of the Ministry of Economy.

Census officers and technical and administrative assistants who have been temporarily transferred from the Ministry of Agriculture or some other government office will generally receive their same salaries but will temporarily be paid by NSO funds.

Separate forms will be used by the office supervisory staff to request reimbursement for travel expenses, which will be on the basis of a daily allowance during periods of travel. The allowance is intended to cover costs of transportation, lodging, and meals. Separate checks will be issued for travel claims.

7.3 Field enumeration staff

Both field supervisors and enumerators will be paid in cash on the basis of certified pay authorizations (see Pay Authorization, Form A-105 in exhibit V-2-19, which is included as a reference exhibit in Unit II).

Each supervisor will maintain a record (in the Supervisor's Record Book) of each day he works and the number of kilometers he travels each day. At the end of each week, he will prepare his pay authorization form in triplicate. In Section II of the Pay Authorization, he will certify to the number of days he has worked that week, the number of kilometers he has traveled, and miscellaneous expenses he has incurred while on official duty--bridge tolls, bus fares, telephone calls, etc. He will submit all three copies to the PCO, for approval and completion, on the next scheduled pick-up date for his district. When approved, the PCO will return his copy to him and the other two copies to the District Office of the Ministry of Economy, which is authorized to disburse funds for the NSO. Upon presentation of his copy to the disbursing officer at the Ministry office, a "Payment Number" will be entered on all three copies of the form. Upon receiving payment, the supervisor will sign the three copies, acknowledging receipt of his salary. The disbursing officer will keep one copy of the authorization, return a copy to the PCO, and send the third copy to the Administrative Section of the Field Operations Division at the NSO for accounting purposes. There will be a slight time lag before the supervisor receives his pay for the first week, but thereafter he should be paid at approximately the same time each week.

Supervisors will issue pay authorizations to enumerators for PSU's for which listing has been satisfactorily completed, for PSU's for which questionnaires have been satisfactorily completed, for each completed questionnaire for a National Certainty holding, and for miscellaneous expenses such as tolls or telephone calls. This will be done to provide frequent payments to enumerators. Supervisors will probably issue a pay authorization for one or more of these items on each visit to an enumerator as the work progresses.

Payment for listing a PSU and for filling the questionnaires for a subsample of holdings in

the PSU will be on a fee basis. This fee system was decided on, rather than a piece-rate basis, for purposes of cost control. It would be extremely difficult to budget for the enumeration costs if enumerators were to be paid by the hour; for example, or for each kilometer traveled, each holding listed, or each questionnaire filled. Keeping records of such variables in itself would be time-consuming and subject to considerable inaccuracy; furthermore, it would delay reimbursement to enumerators until their assignments had been completely reviewed.

Cost records for the 1961 Census of Agriculture and the 1960 Census of Population were studied in an effort to set fee schedules for listing or filling questionnaires, and to establish a travel allowance which would be fairly equitable for enumerators for the estimated length of employment, estimated size of workload, and estimated distances to be traveled in and between sample PSU's. The fees were determined on the basis of an average of 80 to 100 listings and 20 questionnaires per PSU. It was assumed that a small PSU would offset a large one, and vice versa. Nevertheless, it was recognized that some assignments would be considerably larger than the average and that in these cases some adjustment of the fees would probably be required to adequately compensate enumerators with large workloads. Such pay adjustments will be made after the enumeration is completed, on recommendations of the Province or Territorial Census Officer and the technical assistant.

On the first pay authorization for an enumerator, the supervisor will include the set fee for training. On the last authorization to be issued, he will include the fee for the enumerator's travel allowance. The travel fee will be computed according to the number of sample PSU's completed by the enumerator.

The enumerator will receive one copy of the pay authorization to present to the disbursing officer at the District Office of the Ministry of Economy at his convenience. In the meantime, the supervisor will deliver the other two copies to the same office. When the enumerator presents his pay authorization, the disbursing officer will review all three copies for consistency and then enter a "Payment Number" on all copies. After the enumerator acknowledges receipt of the payment on all three copies, the copies will be distributed in the same manner as for supervisors.

Since there are no District Offices of the Ministry of Economy in the Northern Territory, cash payments will be made to supervisors and enumerators at the time of the scheduled weekly pick up and delivery in each district. Payments will be made by a disbursing officer from the Territorial Governor's Staff for Ministry Affairs who will accompany the truck driver.

Supervisors will number each pay authorization issued in consecutive order and will maintain a record of each authorization in the Supervisor's Record Book.

Records of all enumerator payments will be maintained both at the PCO (TCO) and at NSO headquarters on the Enumerator Payroll Register, Form A-151 (see exhibit V-2-21, included as a reference exhibit in Unit II). Similar records of payments to supervisors will be maintained in the field offices and at NSO headquarters on the Supervisor Payroll Register, Form A-152 (see exhibit V-2-22, which is included as a reference exhibit in Unit II). The payroll registers, which are needed for control and accounting purposes, will provide summary information on field expenditures.

8. *TRANSPORTATION AND COMMUNICATIONS*

An effective transportation and communication system is most essential to a widespread endeavor such as a census. Much time and effort can be wasted through failure or delay in sending and in receiving materials and messages.

8.1 Between NSO and PCO (TCO)

Cartons containing bulk supplies of enumeration materials will be shipped by train and/or truck from the NSO to the PCO (TCO). Large shipments of completed questionnaires and other enumeration materials will be transmitted to the NSO by the field offices in the same manner. The mail system will be used by the NSO to the greatest

extent possible for small packages of additional supplies. Mail service is fairly adequate between Calicut and the Province and Territorial capitals.

For the most part, transmittal of both small packages and communications between the NSO and the PCO (TCO) will be handled by mail. This includes the mailing of weekly progress reports, small amounts of completed questionnaires, memoranda and other correspondence, and Problem Referal Sheets which are being sent to the NSO for reply. A Problem Referral Form A-101, (see exhibit V-2-15, included as a reference exhibit in Unit II), is to be used for reporting unusual situations or for requesting instructions for an unusual problem. It may be initiated by the PCO (TCO), by the district supervisor, or by an enumerator. If problem referrals from supervisors or enumerators cannot be resolved at the PCO (TCO) level, they are transmitted to the NSO for solution.

As needed, telephone and telegraph communications will be used between the PCO (TCO) and the NSO. Telephone and telegraph communications will be reserved for matters of extreme urgency that cannot wait for mail delivery. One exception, however, is the requirement that the PCO (TCO) report to the NSO by telephone (or telegraph) each week on the progress of enumerator recruitment.

8.2 Between PCO (TCO) and field enumeration staff

Public transportation facilities within Provinces and especially in the Northern Territory are generally inadequate to handle the flow of completed enumeration materials from the field to the PCO (TCO) as rapidly as necessary. Consequently, it was decided that each census office would be provided with a truck which would make regular weekly pick-up and delivery trips to each district. In each district in the Provinces, the District Office of the Ministry of Economy will be the pick-up and delivery point, with stops to be made on a designated day each week. Supervisors in the Provinces are not required to be present when the pick-up and delivery truck makes its regular stops at the Ministry of Economy office.

In the Northern Territory, where there are no district offices for the Ministries, trucks will make regular stops at a designated place and time near the supervisor's home. Supervisors will have to meet the trucks and have their materials ready to be picked up at that time. As discussed above, it will also be necessary for both the supervisors and the enumerators to present their pay authorizations for payment during these scheduled truck stops. Specific arrangements for such stops will have to be made well in advance of the agreed-upon dates.

In addition to completed questionnaires, other materials which supervisors will transmit by way of the weekly pick-up and delivery system include their own weekly pay authorizations for approval, problem referrals which they or their enumerators initiate, weekly progress reports, and any other necessary communications or reports. As convenient throughout the week, supervisors will deposit these items with the District Office of the Ministry of Economy. Personnel forms (applications and enumerator selection tests) will be transmitted to the PCO (TCO) in the first shipment following training of enumerators; these forms will constitute the PCO (TCO) personnel files for enumerators who are working.

The Technical Assistant will meet each supervisor, approximately every 2 weeks, to observe and review the supervisor's work. Special arrangements for such meetings will be necessary in the Northern Territory. In the Provinces, these meetings will usually take place at the District Office of the Ministry of Economy. Transportation in and around the district during these visits will be provided by the supervisor. Advance arrangements about the meetings or communications regarding enumeration problems in a district will usually be handled by written memoranda from the Technical Assistant, sent on the regular pick-up and delivery trip. However, in urgent situations in the Provinces, the Technical Assistant will sometimes request the District Office of the Ministry of Economy to direct a particular supervisor to contact the PCO by telephone.

Chapter II - 3. MAPPING FOR THE 1970 CENSUSES

1. NEED FOR MAPS

Maps are essential in taking a census. They provide the means by which areas can be readily subdivided for purposes of interviewing, tabulating, and publishing data. They also show the location of places and areas to be enumerated, prevent jurisdictional overlapping of field offices, help avoid duplication or omission of information, and assist in defining and locating boundaries. Maps are a help in making planning or operational decisions in regard to routes of travel, size of enumeration areas, and number of employees required in the field. If maps are not available or are incorrect, improvisations are necessary, and the accuracy of the census may be impaired.

In Agrostan, the NSO authorities were well aware of the need for maps. Furthermore, earlier experiences in the 1950 and 1960 Censuses of Population had convinced them that faulty maps also fostered inaccurate censuses. As a result, the Geography Division of the NSO was requested to formulate a comprehensive program for the 1970 Census of Population. Its task was threefold:

(1) Prepare and reproduce all the maps needed to carry out the enumeration.

(2) Show all required boundaries clearly and precisely.

(3) Assist in the publication of maps and graphics dealing with census data.

Emphasis is to be placed not only on complete area coverage but also on the upgrading of the quality of the product.

Before an attempt is made to describe the steps which should be taken in carrying through a mapping program, it is important to know something about the kinds of maps needed in census work. For purposes of simplification, census maps for field use can generally be classed as (a) maps needed by enumerators in order to locate boundaries and respondents for a relatively small area--the enumeration area, and (b) maps needed by census supervisors and administrators, whose requirements are different from those of the enumerators.

2. CHARACTERISTICS OF CENSUS MAPS

Maps differ a great deal in terms of theme, size of area covered, and general format. They can show landforms, drainage, crops, settlement, house types, transportation networks, and a wide variety of other features which may be important in census operations.

They are often constructed for specific uses by such people as navigators, salesmen, soldiers, planners, geologists, or government officials. A census agency is no different in this respect. It needs many kinds of maps, depending upon the type of enumeration, the kind of area involved, and the needs of the various people employed in doing the work. There is not, then, a standard map which can be used by an enumerator for all types of censuses or for the same census. What is adequate for housing may not suffice for an enumeration of retail stores; what is serviceable in a rural area may not be acceptable for use in an urban area.

Maps prepared for special purposes usually require extra effort. Those used in many sampling operations, for example, fall into this category. Selection of the sample areas is up to the subject matter technicians; after the selection has been made, special efforts are often made to upgrade the quality of the maps for these areas.

Certain general statements can be made in regard to the requirements of all census maps.

The more important items are listed below:

(1) Distance is slightly less important than the portrayal of features which are in proper relationship to each other. Whether a structure lies 50 or 70 meters from the road is relatively less significant than whether it is located on the correct side of the road.

(2) All boundaries which define areas for which data are to be reported must be shown as clearly and accurately as possible in relation to other features of the landscape.

(3) Maps should be simple and contain little information which is not pertinent to the work and needs of the user. A detailed and complicated map will only serve to confuse, since most individuals involved in census work are not well versed in map use.

(4) It is essential that features and names be shown clearly, since most maps will be reproduced many times. If copies are blurred, the utility of the map may decrease sharply.

(5) Map distance should be shown by means of a graphic scale, since it does not have to be altered in the event that the map is enlarged or reduced in size.

(6) It is important that all names be spelled correctly and reflect any recent change. Names used in a census should be those which are commonly recognized by local people.

As a general rule, information should be included on a map if it assists the user in determining his position; if it helps to identify boundaries of an area; or if it shows the location of the census unit which is being enumerated, such as a house or an agricultural holding.

2.1 Physical and cultural features

Features shown on census maps fall into two categories: the physical and the cultural (or nonphysical).

Physical features include crest lines, rivers, marshes, and lakes. Many of them can be used as boundaries to help the map reader to find his location on the ground. However, care should be exercised generally in selecting intermittent streams, since they may be difficult to locate during the dry season. Mountain ridges can also be chosen, but it may often be hard to find nearby features in the lowland with which to connect the highland boundary. Generally, contour or topographic maps (see exhibit II-3-2) are needed in order to locate mountain crests in fairly exact fashion.

Cultural features, such as highways, streets, or trails should be shown on census maps (see exhibit II-3-2). Quality of roads is important, since it provides some indication of the ability to sustain heavy traffic; it can also be of help in estimating the travel time needed for canvassing. This information may be particularly important if the time of enumeration coincides with a rainy or very cold season. Other features which can be useful, if shown, include transmission lines, telegraph and telephone lines, railroads, canals, and permanent, well-defined irrigation and drainage ditches.

2.2 Boundaries

Normally, the best boundaries which would delimit an area are those which can be seen easily on the ground--roads, streams, railroad tracks. Nevertheless, since it is necessary to adhere to administrative area limits, imaginary lines must often be used. Sometimes, property lines may be followed in order to bound areas; at other times, offset lines (short, imaginary lines connecting visible features) can also be drawn, if necessary, to complete a boundary.

In some countries, administrative areas may fluctuate in size and their boundaries will move accordingly. This is not characteristic of Agrostan; but in some countries, situations of this kind have posed serious problems in the past. It may, as a result, be desirable to establish a terminal date, after which further changes will not be reflected in the census statistics. If this is not done, a great deal of time and effort is expended in keeping the maps current. One difficulty with this kind of solution, however, is that it may confuse both enumerator and respondent, since the map will not then represent the true situation on the ground. Accordingly, it may be desirable to obtain an agreement whereby boundary changes after a certain date would not be recognized for purposes of the censuses.

2.3 Periphery

Census maps, as a general rule, must show the landscape surrounding the place or area which has been defined. The purpose of this requirement is to help the map user to locate boundaries on the ground. If points outside such lines are shown on a map, the limits of an area can be more easily determined.

2.4 Location and names of places

Settlement patterns should be indicated on maps, if the information is available. Cities and hamlets can be shown, if necessary, by means of insets, in which needed detail is enlarged for purposes of enumeration (see exhibit II-3-2). If the location of buildings is not definitely known, it is safer to omit such information; users are more confused by erroneously located features than by lack of information.

If several names are commonly used for one place, they should all be shown on the map, if possible. In any event, since it is important to obtain names of places for census maps, attention is called to some sources of information which might prove helpful; for example, the gazetteers and geographic publications of government and private organizations. However, enumerator's maps may require place name detail at a level which these sources cannot furnish and some field work may be needed.

2.5 Map scale

Map scale refers to the relationship of distance between features shown on the map and actual distance on the ground. Generally, scale can be shown in three ways:

(1) A word statement. This simply explains the map-ground relationship; an example might be "one inch to one mile".

(2) A fraction or ratio. The representative fraction indicates the map and ground distances, using an arbitrarily chosen unit of measure, such as inches or centimeters; the units on either side of the fraction or ratio, however, must be the same. Thus, 1:5,000 could be defined as one inch to 5,000 inches or one centimeter to 5,000 centimeters.

(3) Graphic form. A graphic, or horizontal scale, depicts distance by means of a line of designated size which is divided into standard lengths.

Maps are often characterized as having large, intermediate, or small scales. For example, 1:500,000 to 1:250,000 might be considered small scale; 1:100,000 to 1:25,000 might be intermediate scale; and 1:12,000 to 1:2,000 might be large scale. However, the exact lines of demarcation between these various categories is a matter of conjecture. Authorities do not generally agree on most limits. As a general guide, it might be remembered that small-scale maps encompass comparatively large areas, and vice versa.

2.6 Map paper

It may be worth mentioning that care should be exercised in choosing map paper and reproduction methods so that the end product will be able to withstand rough use, often over a long period of time. This is a very practical and important consideration, since poor quality material may impair the usability of the map and delay operations until the map is replaced. Lamination, in which a thin protective plastic film is attached to the paper, can be used on those maps which might have to withstand much abuse. However, it should not normally be necessary to protect maps to this degree in census work.

3. ENUMERATOR'S MAPS

There are more enumerator's maps prepared for census work than any other kind. As indicated above, these are maps which define the precise area which an enumerator should cover--no more and no less. For a complete enumeration, all the enumerator's maps put together (excluding periphery) would cover the entire area to be included in a census, with no duplication or omission. It is important that maps be of good quality so that a high order of accuracy in data gathering is maintained.

3.1 Map features

Following are some of the features which should be shown on the enumerator's maps.

(1) A north arrow, for use as a directional guide.

(2) A graphic scale, by which a line is divided into standard size intervals. The enumerator is not trained to interpret word statements, fractions, or ratios (as described in section 2.5). Thus, for example, a scale of "one inch to one mile" or 1:10,000 is of little use to the average enumerator.

(3) An identifying geographic code number, which will also indicate the major and minor administrative divisions in which the enumeration area (EA) is located. For Agrostan, the major and minor divisions would be the Province and the District. Names and codes of these divisions should be included on the map in addition to the EA number (or PSU number, described later).

(4) A legend, which explains all symbols on the map.

(5) Peripheral area, to help the enumerator locate boundaries.

(6) Names of physical and cultural features, printed clearly.

(7) Roads with double lines. This makes clear that a boundary running down the middle of a road includes one side but not the other. If single-line roads are used as boundaries, the enumerator might not remember his instructions and therefore would canvass both sides. Because of the higher costs involved in retracing maps to ensure that all roads appear as double lines, there is often no alternative to using single lines. Where single lines are used, it would be desirable to include an explanatory statement on the map.

(8) Colored line boundaries, preferably in red or orange. Since the color must be applied manually, it is a time-consuming task. The copy for the enumerator and the original which is filed in the NSO office would have red or orange solid lines for the boundaries. All other maps of this kind on which color would not be used can indicate the outer boundary by means of a black, wiggly line with tight curves or meanders. A wiggly line reproduces clearly and does not obscure the boundary features beneath it. While not mandatory, a word description of the boundary is desirable and might be included on the map.

(9) Location of buildings indicated. All buildings should be shown if their location can be fairly accurately determined. The map should ideally include, by the use of appropriate symbols, detached dwellings, multi-dwelling and nonresidential structures, and other structures if occupied or otherwise used.

(10) Reasonably large scale. Enumerator's maps should be large scale. They generally will vary from 1:12,000 to 1:5,000 in urban areas to 1:25,000 to 1:10,000 in rural areas, as a result of differences in sizes of rural and urban enumeration areas.

3.2 Illustrations of map features, right and wrong

Exhibit II-3-3 illustrates some common errors which should be avoided in preparing enumerator's maps. The first example is concerned with the improper use of imaginary lines. On the "wrong" map, it can be seen that several of the imaginary line boundaries do not begin or end at features which are clearly visible. In another case, an intermittent stream is followed; the stream may be hard for an enumerator to locate if the census takes place during the dry season. Note that, in the "right" example, the distance from the imaginary line which parallels the main road is shown.

The second example involves the use of single-line roads as boundaries. Many countries may be forced to show roads in this manner because the task of converting single lines on all maps into double lines may be too costly. However, it is not a desirable feature on a map, since it tends to confuse the enumerator, who may not be sure whether both sides of the boundary road are to be canvassed.

The third "wrong" example is one in which a map is produced with insufficient detail and illegible information. This may be due to a poor base map, lack of information, or a bad reproduction because the original was not clear.

The fourth "wrong" example is one in which the landscape around the enumeration area is not shown. In such cases, the enumerator may not be able to recognize the location of his boundaries. If the surrounding area is included on the map, however, he can more readily identify the boundaries of the enumeration area and recognize features which would tell him if he were outside the boundaries.

Other common mistakes might include the following: the use of a map scale which is too small or too large; incorrectly placed features, such as buildings, roads, or streams, which will tend to confuse the enumerator; and lack of a legend. At times, if a large map is cut up into small portions for the enumerator's use, there may not be the time or opportunity to put a legend on each cut-out map. As a result, the symbols used are not identified for the map reader (see example 3) and the margin for error increases

3.3 Training enumerators in the use of maps

Part of the enumerator's training should be devoted to learning how to read and use maps. The instruction should teach them how to (a) orient themselves, (b) interpret the legend and scale, (c) estimate distances, (d) identify the boundaries, (e) canvass systematically and thoroughly. and (f) correct or add information to the map, such as new roads, changes in place names, and disappearance of streets and roads. In urban areas, enumerators may sometimes be called upon to number the city blocks; in rural areas, they may be asked to note certain landmarks or to draw arrows to indicate the direction of travel, so that a specific dwelling can be identified on subsequent visits. Enumerators should also be taught proper care of the maps and the importance of returning them with their enumerated census results

If aerial photographs are used, special training in photo interpretation will be required. Such training presupposes that the enumerators will have the education or ability to absorb this kind of instruction.

3.4 Training supervisors to review maps

In planning assignments for the enumerators, the supervisor is expected to review the enumerator's maps to make sure that they are adequate. Prior to the start of the enumeration, the supervisor is expected to correct the enumerator's map for any major changes which have taken place since the maps were drawn. Supervisors need to be instructed in the same subjects as the enumerators and in the procedure for handling problems that the enumerator cannot resolve.

In addition, the supervisor may be asked to subdivide the enumeration area and to estimate the population or housing unit counts in each segment. On occasion, he may be required to make a rough sketch of an area when an enumerator's map is not available.

An important point to stress in training and one that is too often neglected is that the supervisor should verify that the enumerator turns in his maps with his completed work. All maps should be returned to the NSO without exception, since these maps will be the basis for review and for updating the file.

4. ADMINISTRATIVE-USE MAPS

Maps needed by the supervisors and by the census office staff at each of the administrative levels will vary according to the scale and the amount of detail that is necessary. Requirements may also overlap so that duplicates of maps may be furnished to different offices.

4.1 National Statistical Office maps

The central office of the NSO requires a map of the entire country showing major population agglomerations, terrain features, drainage patterns, and communications and transportation networks. It can be small scale and usually a single sheet. The scale must be adequate enough so that the boundaries of major and intermediate size administrative divisions are clearly shown. Copies should be sent to each major field office; in Agrostan, these would be the Province Census Offices.[1] One of the uses of this map is to indicate the location of the offices with which the NSO would be dealing directly.

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[1] See section 7 regarding maps for Northern Territory.

4.2 Province Census Office maps

In Agrostan, the administrative level immediately below the NSO is the Province Census Office (PCO), which will be responsible for the enumeration of the Province. Each PCO will require full map coverage of the Province. These maps are used to make assignments and to coordinate field work.

These maps should show pertinent cultural and physical features so that it would be possible to determine the difficulties which would be encountered in traversing certain types of terrain. The scale should be of an intermediate type; the maps would probably consist of several sheets which can be pieced together to form one large map. It would be desirable to have a copy of each Province map in the NSO so that special problems of administration could be anticipated and proper resources allocated to trouble areas.

4.3 District supervisor's maps

In Agrostan, the district is the next administrative level. The map for the district supervisor should contain pertinent physical and cultural features, although the detail need not be as great as that shown on the enumerator's maps. Major rivers, streams, roads, trails, streets, and highways should be shown, as well as place names. The scale should be of intermediate size to permit the identification of enumeration area boundaries; however, the exact features which form enumeration area boundaries need not always be shown. Copies of the district supervisor's maps should be available in the PCO.

5. OPERATIONAL STEPS IN A MAPPING PROGRAM

The Geography Division of the NSO must first determine the type and number of maps which are needed. This will depend upon the kind of census being taken, the special needs of NSO subject matter divisions and field offices, the size of the country, the number of areas for which data are to be tabulated, and the quality and number of maps already available. Armed with this information, a plan of action can be formulated to acquire, update, or otherwise improve the coverage.

5.1 Taking an inventory

The first step required in a mapping program is to take an inventory. Pursuant to the regulations set forth by the census authorities, a list is drawn up of all the administrative areas for which data are to be published. This must be carefully done so that omissions and duplications are avoided. For example, suppose that population data are to be tabulated for each urban place and for the rural portion of a district. In Agrostan, an urban place is an agglomeration of 2,000 or more persons, and administrative centers of districts regardless of size. To make sure that all urban places would be separately identified in the 1970 Census of Population, agglomerations down to 1,000 persons (based on the 1960 Census figures) and all administrative centers would be listed. In addition, the rural remainder of each district would be included in the list.

After all urban places and other areas are accounted for, a geographic coding guide is devised to conform to the listing, so that data can then be processed by area. A numbering sequence is arranged, in ascending order, from major to minor civil divisions and special places.

5.2 Compiling an inventory table

An inventory table is then made up, with the names and code numbers of the aforementioned areas put in the stub. Column items furnish information about type and quality of map coverage for each area listed. These items of information would be concerned with scale, dates of map construction, sources, coverage, type and amount of detail, aerial photography and boundary delineation. In each case a qualitative assessment would be made of the map coverage that presently exists for each area.

On the basis of information furnished by the inventory, plans to acquire maps for the complete list can be formulated. The Geography Division can determine where the major gaps are, both in coverage and quality. It then has a better idea of the magnitude of the job to be done and the number and order of steps which have to be taken. The priority order of work will point up the need to deal first with those areas which have comparatively large populations and little in the way of mapping controls; the listing will also alert geographers to the location of extensive areas of this kind. The inventory should help the Geography Division to determine, approximately, the time needed for mapping and the cost of the whole program. An estimation can also be made of the amount and type of preliminary field work that will be required. Given this indication of the needs of the mapping program, the Geography Division can also decide what sort of equipment and machinery is needed.

5.3 Maintaining files for each area

Separate files should be kept for every one of the areas listed in the inventory. A detailed record of steps and procedures should be maintained in each case so that appropriate information can be summarized at any time in order to furnish an overall report of mapping progress.

An attempt should be made, after each census, to keep the inventory current. This may not be possible, however, if funds are not available to establish an ongoing mapping program.

5.4 Acquiring maps

Map acquisition should begin as soon as the plans for a census are announced. However, if censuses are planned for the future, then the job of obtaining maps should be a continuing program.

5.41 Sources.--Maps can be obtained from a variety of sources. Government agencies, for example, may have maps, aerial photographs, or special information which may be of value to census operations. Highway agencies may have maps of the road network; departments of interior or conservation may have maps of special areas such as forests, river basins, or reservations; an agriculture ministry may have soil and land use maps; a geological survey agency may have topographic sheets, or maps showing locations of mining camps; defense agencies may have coverage of training areas and other installations of an unclassified nature, as well as maps of ports, coastal areas, and boundary regions. Maps showing construction housing starts, hydrography, or postal routes may also often be available and helpful.

Other sources of information may be planning departments, development banks, area development organizations, and health and education agencies. Local governments might furnish maps from cadastral records or from police, fire, highway, health, and sanitation departments. Additional sources might include air, rail, and trucking firms; construction and utility companies; engineering organizations; farm cooperatives; libraries; insurance companies; and cartographic firms. International agencies and geographic institutes, such as the International Geographical Union, may also have usable maps. Exchange with other countries is also possible.

The general impression of the average observer is that map coverage in many developing countries is quite limited. This may be true, but the situation is changing. Large portions of many countries all over the world have been photographed and are being mapped. Very often, as noted, good sources for maps can be found in international agencies.

5.42 Legal rights.--Maps can be obtained by contract or by cooperative effort. If private agencies are involved, care must be exercised to ensure that copyright laws or other legal rights are observed. Often an agreement is made that these maps will not be used for anything but census purposes.

5.5 Preparing base maps

The base map is the primary one from which various census maps are constructed. It may be the map used in the previous census, or a later one that is more suitable. In choosing a base, the decision must first be made as to which of the available maps best serves specific census needs. The selection depends on the scale, whether the map is sufficiently current, its ability to be reproduced, and the mode of presentation of physical and cultural features. Certain of these features may have to be deleted if they are unnecessary or confusing and others may have to be added. New base maps are usually developed if the earlier maps are poor and if new sources of information become available. Maps which normally would be unacceptable, may have to be used if funds or time do not allow for the upgrading of the quality of the coverage.

Maps obtained from different sources can be converted to a common scale by means of photography. Then a composite map for an area can be prepared and sent to local authorities for correction, time permitting.

The base map should be as up to date as it is feasible to make it. Updated information may be obtained from a variety of sources. For example, it can come from previous census maps which were corrected by field personnel at the time of the enumeration; from surveys and work of various government agencies, such as health or education; from local officials; from topographic maps; and from aerial photographs. Sometimes a map represents a composite from two sources of information, and in some rarer cases, three sources may be involved.

The end product of a base map which is to be used for enumeration purposes is a large-scale sheet showing appropriate physical and cultural features. Enumeration areas are delineated and numbered on it. The map is then divided into smaller segments for use by individual enumerators; these segments are referred to as the enumerator's "cut-out" maps.

5.51 Use of general- and specific-purpose maps.--The maps which are used to construct a base may vary considerably. Some may show general features of the landscape, such as topographic sheets; whereas others may have been developed for specific uses, such as health survey maps. Generally, topographic, highway, planning, and urban-place maps are the most commonly used. They normally provide greater coverage of the areas involved than maps obtained from other sources. Furthermore, the mode of presentation of detail often accords to the needs of the users of census maps; accordingly, they require less correction and alteration.

5.52 Use of aerial photographs.--Aerial photographs, if current, show physical and cultural features in their correct perspective and are of great help in map preparation. Base maps can be constructed from photo overlays (see exhibit II-3-1). A great deal of table or floor space is needed, in this case, so that the tracings can be made; the Geography Division must make plans accordingly.

There are several problems which must be faced in using photographs:

(1) The accuracy of the sheet decreases toward its edges. Consequently, features such as roads and rivers may not coincide, and some adjustment is therefore necessary. Generally, a simple correction of displaced features so that they join at the edges of the photograph is acceptable enough for census purposes.

(2) Certain information must be added to the maps, such as graphic scale, north arrow, names, and boundaries.

(3) Some key ground features may be obscured on the photograph because of the tree cover.

Some type of field work is generally required to obtain names of places, roads, boundaries, and other features.

5.6 Obtaining field information

Field work in connection with mapping is required for a variety of reasons. For example, it is needed if maps are not available, or if maps or photographs do not show names of features

and administrative boundaries. Additional information can be added during the course of the investigation--roads can be classified, buildings can be identified by types, estimates can be made of housing units in a subdivided area, boundary discrepancies of administrative areas can be cleared up. When possible, rough sketches are usually made of the area prior to the field trip, so that the investigators have some rudimentary map from which to start their work.

Mapping assistance can also be obtained by having responsible individuals in the area supply information to the NSO. Local government officials, police, teachers, and even members of the Armed Forces may be able to do some of this work. A number of countries have undertaken this sort of field operation with favorable results. Certainly, given the limited budgets, this sort of program has some appeal. As a point of interest, it might be noted that local officials, in a number of cases, have heartily endorsed such programs, since they had never before seen maps of areas under their jurisdiction.

This method of conducting field work must be carefully conceived and administered if the end product is to be accurate. If local people are to be motivated into trying to do a good job, it is necessary to develop in them some understanding of the need and usefulness of their work. However, even if this is done, the abilities and education of the persons involved will have a direct bearing on the degree of reliability of the end product.

In urban areas, officials may be asked to correct the maps, to supply the names of streets, to locate and identify buildings which are not living quarters, to locate city limits, and to make estimates of the population by subdivisions of the city. In rural areas, officials may be called upon to check boundaries of intermediate and minor civil divisions, to list and locate all agglomerations and to estimate the populations of the various areas. Such work should be completed at least 1 year in advance of the census. This is usually long enough to permit a follow-up program and thus ensure a high proportion of returns; it also permits a check to be made if it appears that instructions have not been strictly followed or if the information on the corrected maps is not clear.

5.7 Establishing enumeration areas

Once the field work has been completed and the base maps prepared in final form, the enumeration areas (EA's) can be delineated.[2] Information from various sources is used in order to select appropriate boundaries. Aside from features on the base map, use is made of aerial photographs, field estimates and observations, EA maps from the previous census, and any other maps which may provide even partial information concerning the characteristics and density of the area in question.

The census staff will normally establish certain criteria which are to be followed in determining how large an EA should be; usually these criteria are defined in terms of the number of persons to be enumerated, although consideration is given to other factors which would affect the enumerator's workload. The land area size of the EA is conditioned by such factors as type of terrain and the ability to traverse it during the season of the year in which the census is taken; the quality of the roads; the kinds of vehicles, if any, that are to be used to transport the enumerators; and the length of the census period. The average level of education of the enumerators and the respondents, the length of the interview, and the density of the area will also affect the size of the EA. Rural EA's are often defined so that they are smaller in population but larger in land area than their urban counterparts. In most cases, it can be said that the size of the

[2] In Agrostan, an enumeration area is an administrative area for purposes of taking the population census. In urban areas, one EA is assigned to several enumerators so that the census can be completed in 1 or 2 days; in rural areas, an EA is assigned to one enumerator to complete in 1 or 2 weeks.

EA, in terms of population and land area, is commensurate with the ability of the enumerator to complete the job in the required time.

5.8 Estimating map needs, time, and costs

It is difficult to estimate the map reproduction, timing, and financial needs of a census mapping program in very specific terms. They depend in large measure on the size of the country and the quantity and quality of the map coverage. Hence, statements concerning these subjects must be understood as providing only a general frame of reference which can then be applied to the special situation prevailing in a particular country.

5.81 Map needs.--As explained earlier in this chapter, various kinds of maps are needed for a census, some with considerably more detail than others. Furthermore, they differ in the number of copies that are needed and in the map size itself. Supervisor's and enumerator's maps are needed in the greatest numbers, and copies of both sets of maps are needed in the Province Census Office. Moreover, if the enumerator's maps are "cut-outs" of base maps which cover large areas, a sizable number of base maps must be reproduced. For example, one base map showing five EA's may not furnish five separate enumerator's maps since the periphery must be included on each. If an enumerator's map is lost, some means must be developed to provide a duplicate quickly. If all copies are lost, a sketch must be made in the field.

Map reproduction equipment varies greatly in price and complexity. It must be able to meet one of the Geography Division's primary needs--to turn out maps in large quantities and at low cost. Accordingly, in purchasing, loaning, or renting equipment, attention should be paid to such practical considerations as the size of the sheets which can be processed, the type of paper which can be used, the clarity of reproduced features on the copies, the speed of reproduction, and the cost per item.

5.82 Time.--As with costs, it is difficult to develop an accurate time schedule for a mapping program. Obviously, there will probably be a close relationship between the magnitude of the job and the time required. Generally, an estimate of time must depend on the size of the staff, the size of the country and the results of the map inventory. A minimum of 3 years, on an average, is probably needed to do the work; however, this estimate is subject to change for many reasons. In any event, allowance of too short a time span for the work enhances the chances that the quality of the final product will deteriorate. As a rule of thumb, an inventory should probably be made 3 years in advance of the enumeration and map acquisition should start at least 2 years before the end date. Maps needed for establishing enumeration areas should preferably be available at least 1 year in advance. All maps should be available (and ready for distribution by the Province office) at least 3 months before the census is to be taken.

5.83 Costs.--Only general statements can be made in regard to the financial aspects of census mapping, since expenditures depend on a wide number of variables. As a general rule, however, the cost of the maps needed will range from 5 to 20 percent of the total amount set aside for the entire census. The major cost item is likely to be the preparation of the base maps to be used as the enumerator's maps. The next major cost item might be the field work itself, particularly if the existing map coverage is poor or very much out-of-date. In the allocation of costs, it is important that sufficient funds be set aside and reserved for the final stages--the publication program.

6. MAPS FOR AGROSTAN'S 1970 CENSUSES IN THE PROVINCES

The 1960 Population Census maps in Agrostan generally served as the base on which the 1970 Population Census maps were constructed. Since control and quality were often poor, attempts were made to improve the situation. As a result, field work was often found to be a necessary part of the job of preparing the 1970 maps. Since the 1971 Sample Census of Agriculture will follow

the 1970 Census of Population and Housing, the maps for the agriculture census will be based on the population census map sheets. Here, too, some additional efforts will need to be made for certain areas in order to improve map coverage.

6.1 Map coverage

In 1960 in Agrostan, budgetary considerations, shortage of time, and staffing problems did not permit the development of a very comprehensive map program. Coverage for some areas was very poor, particularly in the less populated parts of the Meseta Norte, in the area around Lake Thaipak, and in the Rico Mountains. The Geography Division was unable to improve this situation at the time. As a result, some areas had no maps or sketches, some were incorrect, and others were outdated or lacked sufficient detail.

A careful assessment was made of coverage, past and present, in preparation for the 1970 Population Census. The inventory revealed the following pattern of map control. Southern Lopez, DuBois, northern Tali, Liberto, and Morgan Provinces had been fairly thoroughly mapped and photographed. There were available some older aerial photos and maps of only fair quality for western Rajpur and western and southern Hassam; map control was not complete, however. Coverage for the rest of the country was not comprehensive; furthermore, it was generally of poor quality. Maps of urban places under 10,000 population were often not available. It was apparent that a great deal of work would have to be done, particularly in Thaipakia, the Meseta, and the Rico Mountains.

6.2 Map sources

Plans for the 1970 Population Census required that separate data be published for all urban places and for the rural portion of each district. Once these requirements were determined, the Geography Division of the NSO was able to compile a list of areas for which maps would be needed, evaluate the maps already on hand, then begin to acquire whatever was lacking. Maps were available primarily from four sources.

6.21 National Cartographic Service.--The National Cartographic Service (NCS) constructs topographic maps from aerial photographs, using standard photogrammetric methods. These maps range in scale from 1:24,000 to 1:250,000 and are based mainly on two aerial surveys taken of certain regions of the country in the periods 1955-57 and 1965-67. Topographic sheets (contour maps) show physical and cultural features precisely (see exhibit II-3-2) and can be transformed into excellent census maps. About 30 districts in Agrostan have been mapped completely; maps for these districts were pieced together from the original topographic sheets. The program is an ongoing one, but progress is slow because of the precision work involved and because of a lack of funds. The 1960 Census base maps are replaced by NSO topographic sheets as they become available. The NSO and the NCS have a working agreement whereby the latter will try to map certain areas proposed by the former, on a priority basis.

6.22 Geography Division of the NSO.--The second source of maps was the Geography Division itself. For the 1960 Census of Population, it had prepared maps of about 60 districts from overlays of aerial photos, at scales of about 1:40,000. These maps did not meet standards of accuracy such as those found on the NCS topographic sheets, but they were serviceable for census purposes. Coverage in the remaining districts was less complete and of poorer quality; approximately half of the enumerator's and supervisor's field maps were missing and most of those which had been returned had not been corrected or the changes made on them were not legible.

In addition, there were on file in the NSO good, large-scale maps for Calicut and Hankow cities. Maps with less reliable control were available for all cities down to 10,000 population. About three-fourths of the remaining urban places were only roughly sketched, and few of them indicate the city limits that are recognized by the local authorities.

6.23 Ministry of Health, Education, and Welfare.--The third major source of maps is the Malarial Control Division of the Ministry of Health, Education, and Welfare. Teams of people working in the southern half of the country in the decade of the 1950's had made crude approximations of the number and location of housing units for hundreds of small settlements; this information was made available to the Geography Division of the NSO.

6.24 International sources.--A map series at a scale of 1:500,000 was obtained from an international foundation prior to the 1970 Population Census. It covered the eastern parts of Thaipakia and the Meseta Norte. The maps were enlarged and individual district maps were drawn on tracing cloth. They were then sent to local officials about a year before the enumeration; these individuals were requested to put on detail, such as rivers, roads, trails, and settlements. The results were not very satisfactory.

6.25 Other sources.--Other sources of large-scale maps of Agrostan included the following: the railroads, several trucking firms, a petroleum company which had prepared a series of road maps, some planning agencies, several large plantations, and the hydrographic office. In addition, some aerial photographic coverage was obtained by contract with the Air Force, which agreed to fly a few training missions over areas specified by the NSO. There was also an arrangement with the NCS to help map all urban places from air photographs. Few results were available in time for the 1970 Census, however.

6.3 Base maps

The base maps used in the 1970 Population Census ranged in quality from excellent to very poor. Those which were constructed from topographic sheets were best, as were some maps obtained for several of the larger cities. Aerial photographs were also used in some areas, supplanting earlier, poorer 1960 coverage.

In many areas, time and cost did not permit the construction of an adequate base. As a consequence, only rough sketch maps were supplied. In a few urban places and hamlets, maps were not used at all, because census field personnel did not have the time to make sketches or else felt that they were unnecessary.

Field work had to be carried out in a number of areas. The Geography Division obtained information from local officials in some cases, and from census personnel assigned to specific field tasks in other cases. Local authorities and teachers were provided with detailed instructions on how to check administrative boundaries, supply place names, and add or correct map features by the use of standardized symbols and signs. In addition, local officials were sometimes asked to supply population estimates. Field work of this nature was carried out in all parts of Agrostan. A team of geographers from the NSO was sent into eastern Hassam and Rajpur Provinces to check the maps which had been prepared from new and recent aerial photographic coverage of this area. They concentrated on obtaining names, boundaries, and population estimates.

The EA's which were delineated by the Geography Division did not cover the entire area of the 13 Provinces. Because of the pressure of time, some EA's were actually defined by census field supervisors themselves while they reviewed enumerator assignments. About 10 percent of the EA's were actually defined by field supervisors, who had not received pertinent training in delineating these types of areas. However, there were fewer such cases in 1970 than in 1960.

In Agrostan, districts are divided into subdistricts; the subdistricts in turn are divided into EA's for purposes of the population censuses. All the EA's in the country were numbered according to a geographic code so that each could be uniquely identified by the subdistrict, district, and province in which it is located.

6.4 Use of Population Census maps

One of the early decisions of the NSO was that the agriculture census would be a sample census and that it would be taken in January 1972, more than a year and a half after the 1970 Census of Population. The sample would consist of approximately 20 PSU's (primary sampling units) per district. On the average, 4 or 5 enumerators under the direction of a district supervisor would be required for each district. The district supervisors would report directly to the Province Census Offices, and the 13 Province Census Offices would report directly to the NSO.[3]

6.41 Sample PSU's.--Ordinarily, each sample PSU for the agriculture census will be an EA selected from the EA's enumerated in the 1970 Census of Population. Where the 1970 Population EA's are small (in population size), two or more will be combined before the sample selection is made; if the combined EA's fall in the agriculture sample, then the combined area becomes one sample PSU for the agriculture census. Where the 1970 Population EA is large, the district supervisor will be asked to subdivide the EA and estimate the population in each portion. The portion of the EA that is selected for the agriculture census becomes the sample PSU. The district supervisor is expected to modify the enumerator's map by cross-hatching the portion of the EA that is not in the agriculture sample.

The sample PSU's in each district will be numbered in sequence, starting with 01. Thus, with the province and district code, each PSU will have a unique code number.

6.42 Subdividing large EA's.--To subdivide the large EA's, the supervisor will receive training on how to select boundaries which would subdivide the area. Boundaries should be clearly visible in the field; any imaginary boundary that is used should follow the guidelines noted earlier in this chapter (in section 2.2). The supervisor will also be trained to estimate the population in the portions of the EA so that he can divide the EA into two or more approximately equal PSU's (see exhibit II-3-4).

6.43 Review of Population Census maps.--One of the tasks for the Geography Division is to review the 1970 Population Census maps with the intent to upgrade the quality. This review would be limited to those PSU's (EA's) which fall in the agriculture sample. Those which do not have adequate detail or identification should be improved for use in the agriculture census.

6.44 Map needs.--Once the decision is made to take a sample census and to use the 1970 Population EA's as the unit for listing and sampling agricultural holdings, a number of the mapping requirements are known. As a minimum, the following are needed:

(1) The NSO should have a map of the entire country, showing Province and district boundaries, terrain features, drainage patterns, communications and transportation networks. It can be small scale. Copies should be available in each Province Census Office (PCO). Most likely, the maps used in these offices during the 1970 Population Census can be used without modification.

(2) Each PCO should have a map of intermediate scale showing full coverage of the Province. Copies should be available in the NSO. As with the country map, the 1970 Population Census maps of the Provinces probably can be used with only slight modification; the sample PSU's in each district should be shaded so that the PCO can readily spot the areas to be enumerated.

(3) Each district supervisor should have a map of his entire district showing the location of the sample PSU's and the location of the National Certainty holdings (large holdings to be enumerated on a 100-percent basis). The map should be of intermediate scale and should show major physical and cultural features but not as much detail as the enumerator's maps. Copies of the district maps should be available in the PCO and in the NSO.

    A copy of the district supervisor's map should be reproduced for each of the enumerators in the district. This map will serve as a sort of key map for the enumerator to locate his sample PSU's and National Certainty holdings, and to plan his travel efficiently.

(4) An enumerator's map should accompany each sample PSU. It should be large scale and contain as much detail as the NSO can provide.

[3] See chapter 2 of Unit II of the case study.

The boundaries should be outlined in a solid red or orange line. A copy should be on file in the NSO, and another should be available in the PCO in case the field copy is lost.

In preparing the district supervisor's maps and the enumerator's maps, the 1970 Population Census subdistrict codes and population EA numbers would be removed to avoid confusion. The sample PSU number for the agriculture census would be added (see exhibits II-3-5 and II-3-6).

6.45 Timing.--The amount of time needed to prepare the maps for the agriculture census will be relatively little in comparison with the time spent in preparing the maps for the population census. As soon as the sample is selected, the EA maps for the sample PSU's should be reviewed and action taken as necessary. All the map work should be completed at least 3 months before the enumeration begins. This will allow time for the district supervisors to review the enumerator's maps and to plot the location of the National Certainty holdings.

7. *MAPPING FOR THE NORTHERN TERRITORY*

There were no previous censuses in the Northern Territory, and very little map coverage was available for use in the 1970 Population Census. Such maps as were available came from the same sources as those listed in section 6.2. For the 1970 Censuses, it was agreed that a mapping program would be started but it would be a very modest one, for several reasons:

(1) Complete coverage for large-scale enumerator's maps would be impractical and costly.

(2) Maps for the chiefdoms are not absolutely essential, since each tribal group can identify the boundaries of its chiefdom.

7.1 *Population Census*

In the Northern Territory, there are some mining camps, large plantations usually owned by non-natives, and other settlements not associated with any tribal group. During the 1970 Population Census, the marshals in each of the territorial districts assisted the enumerators in drawing rough sketches of all inhabited areas not associated with a chiefdom. These areas were designated as "Special EA's".

As described in Unit I of the case study, the Northern Territory has three zones, which are further divided into a total of 18 territorial districts. The zones and districts were assigned geographic code numbers. Within each district, the chiefdoms[4] and Special EA's were numbered in sequence so that each chiefdom and Special EA would have a unique code.

7.2 *Agriculture Census*

For the agriculture census, the sample will be selected from the chiefdoms and Special EA's and a new sample PSU number will be assigned, using a separate series in each of the three zones. Thus, the zone code and the sample PSU number will uniquely identify each sample PSU.

The following maps will be needed:

(1) The Population Census sketch maps for the Special EA's that fall in the sample can be reproduced for the agriculture census. These should be large-scale maps, to be used by the enumerator. A copy of these maps should be available in the Territorial Census Office and in the NSO.

(2) The enumerator should have a map of the territorial district in which he will be enumerating. This map would indicate the approximate location of the Special EA's and the chiefdoms that fall in the sample. The map should be of large scale and should show the major physical and cultural features. Copies of these maps should be available in the Territorial Census Office and in the NSO.

(3) The maps for the Territorial District supervisors can be copies of those described in (2).

8. *OBJECTIVES AND ORGANIZATION OF THE GEOGRAPHY DIVISION*

A geography division given the job of filling all the geography needs of the NSO has a considerable number of tasks assigned to it. In general terms, it would have two major objectives: (a) to supply maps of those areas for which the census is

[4] For the 1970 Population Census, each chiefdom was considered as one EA; the larger chiefdoms were subdivided more or less arbitrarily by the field supervisor and assigned to several enumerators.

to report data, and (b) to delineate boundaries in as exact a manner as is possible. The organization of the Geography Division would reflect these objectives.

8.1 Work assignments and functions

The Geography Division must construct, acquire, and update census maps. Allied tasks include defining boundaries and establishing statistical areas, if feasible. In carrying out its functions, the Division must develop close working relationships with other mapping agencies in the government. It should also maintain active contact, through proper channels, with private and international organizations which can help supply it with maps and information which will be of value in taking a census.

8.11 Prepare and reproduce maps for census enumeration.--The first job of the Geography Division is to prepare maps for use in censuses of varying types and frequency. It has been noted that these maps would be of many different kinds, depending upon the needs of the user.

The boundaries of all areas for which information is to be tabulated must also be determined. This is often a difficult chore, since administrative boundaries may be poorly defined. Thus, clarification of the location of these lines can often be considered as a side benefit stemming from the work of a Geography Division. However, the NSO can usually do no more than point to boundary discrepancies; decisions to resolve the situation are normally not within the scope of its delegated authority.

Another important function of a Geography Division is map reproduction. It is imperative that copies be obtained cheaply, quickly, and in sufficient quantities to meet the operational demands of the census agency.

8.12 Prepare maps for publication.--The preparation of published maps, graphs, and charts which help reveal the spatial relationships of statistical information is another task of the Geography Division. If presented in meaningful fashion, such graphics enhance the value and usefulness of the census figures. One further requirement, in this regard, is to prepare maps which show the boundaries of areas and the location of places for which data are being reported.

8.13 Update and prepare maps for current surveys.--Post-censal operations involve the updating and qualitative improvement of maps and a continuing program of map acquisition. The Geography Division should also try to keep abreast of administrative area boundary changes. It may also be involved in establishing statistical areas or in preparing maps for current sample surveys. Usually, however, such work is kept to a bare minimum as a result of small budget allowances.

8.14 Delineate statistical areas.--The delineation of statistical areas, undertaken in accordance with the specifications laid down by the census staff, may often become another task assigned to the Geography Division. Statistical areas usually are formed so that they possess some cultural or economic uniformity. However, these areas are defined for data-gathering purposes and do not therefore correspond to governmental or administrative divisions, which are officially designated segments of the country.

Urban places are one of the types of statistical areas that are defined for many census data needs. However, many developing nations have done little to establish the exact limits of urban places. As a result, data suffer accordingly; for example, figures on rural to urban migration tend to be less reliable because such boundaries are vague.

Statistical areas have not been delineated in most developing countries. This is because of the high costs to tabulate both administrative and statistical areas. Furthermore, the definition and mapping of the former is a job of considerable magnitude and must remain the prime objective in developing the area controls of a nation with poor coverage and limited funds. Accordingly, Agrostan has concentrated on administrative areas and has done little with statistical areas.

8.2 Staffing requirements

A Geography Division must be flexible in terms of its table of organization. This is particularly true if the office is a small one in which personnel are often switched from job to job. Certain functions must be performed, however, regardless of staff size or functional subdivision. For this reason, many of the staff must be qualified in several fields.

8.21 Types of employees needed.--There are generally four kinds of employees whose skills are required in census mapping operations.

(1) The first is the draftsman, who needs no special geography training, although such a background is naturally desirable.

(2) The second is the cartographer, who must have a good working knowledge of techniques of map compilation, editing, reproduction, and publication. Such an individual must be well aware of current technological changes in his field. Since good cartographers are in short supply, emerging nations in particular may have to rely on persons who may simply have taken an appropriate school course, or are skilled and capable draftsmen.

(3) The third type of employee with special skills is the geographer. He should, ideally, have a good background in cartography, quantitative geography, demography, and economics. He should also know something about the job of map acquisition. Since demand will probably outstrip supply, it may be necessary to resort to further formal instructions during or in advance of the census mapping program, in order to satisfy the need for skilled personnel of this type.

(4) The last kind of employee, the clerk, can often be trained on the job in order to perform the necessary tasks. Such a person must be able to demonstrate that he can read maps readily. One of his most important jobs would be to delineate the EA's. For this, he must be trained in making boundary choices, in judging the effect of terrain on EA size, and in making use of information from a variety of sources. A clerk should also be able to measure areas so that density data may be calculated. Although great dependence may be placed on competent clerical help, their work must be carefully supervised by a person with an adequate training in geography.

8.22 Training.--Aside from secondary schools and colleges, sources for recruiting qualified employees might include organizations having a map facility, surveying agencies, planning departments, construction and transportation firms, and public utility companies. It may also be possible, under certain special conditions, to make use of cartographers who are members of the Armed Forces.

On-the-job training might include subjects such as drafting, photographic interpretation, boundary delimitation techniques, and methods of map reproduction. Acquiring an adequate, if limited, background of this sort is possible for most persons with the equivalent of several years of secondary school education.

8.3 Equipment

The equipment for the Geography Division office is made up of those cartographic tools and machines which are needed to make and reproduce maps. Their complexity ranges from the simple and inexpensive to the complicated and costly. It is not appropriate to list or describe these machines here; the technology is changing rapidly and budgetary and other considerations may severely limit the choices made in selecting the tools of the trade. Nevertheless, it should be pointed out that, as a minimum, good photographic equipment is desirable and access to cheap and fast duplicating machines is mandatory. Map filing cabinets are useful, but low cost shelving can be made to substitute for them if funds are not available.

9. MAP AND GRAPHICS PRESENTATION

The publication of data in map and chart form is a fairly inexpensive yet advantageous way to show some of the results of the census. The subjects are not limited solely to numbers and distribution of people or agricultural holdings. Maps can also be shown which deal with such subjects as population change, tenure of holdings, land utilization, area harvested in a specific crop, and many others.

9.1 Examples of statistical maps and charts

Exhibit II-3-7 illustrates the use of maps and charts to depict results of the census. The first of these is a choropleth map showing population increase between 1960 and 1970. This is a

quantitative area map in which a symbol representing a certain value is applied uniformly over an entire area, such as a district. Care must be exercised, in this case, in choosing the range of data and the number of symbols to be shown. If this is not done, the map is not easy to read and displays a pattern distorted by a misleading choice of class intervals.

The second illustration is a bar chart showing land utilization, 1971 and 1961. Bars of this kind can also show province data and be placed within province boundaries; however, it is often hard to make comparisons of data for provinces on this type of map.

The third example shows tenure by province; the size of the circles is proportionate to the number of holdings involved. Comparisons between and within provinces are fairly easy to make.

The last exhibit is a simple dot map, in this case showing area cultivated to wheat. It has the virtue of locating the feature shown in a fairly exact manner, unlike the choropleth map. However, care must be taken in choosing the value and size of the dot and in placing it within the designated area. If this is not done properly, dot patterns may appear to mirror the course followed by administrative boundary lines, or they may merge together in one area to produce a large, poorly defined mass.

9.2 Maps for publication

One of the required chores of the Geography Division, as noted earlier, is to prepare area maps for publication in the census reports. The maps may be of various types, simple and complex. As a minimum, simple identification maps should be prepared. These maps show the boundaries of areas and the location of places for which data are to appear in print. A location code guide is set up so that a place identified by a grid number in a table can be found easily on an appropriate accompanying map. No other cultural or physical details need be shown. These maps are fairly easy to construct and inexpensive to publish.

9.3 Objectives

It should be stressed that a proper presentation of the geographical distribution of statistical data requires professional staff skills of a high order. The objective is to reveal spatial patterns which are not as easily grasped in tabular form. If the map only shows what is already common knowledge and does that in overly simple terms, then it contributes little. By contrast, if it attempts to show too much or if the scale of the published map is not adequate to the task, the map becomes hard to read and loses much of its value.

APPENDIX

(Exhibits are arranged in numerical sequence; titles of the exhibits are listed in the table of contents)

Exhibit II-1-1. URBAN AND RURAL POPULATION, FOR THE PROVINCES AND THE NORTHERN TERRITORY: 1950-1971

Residence	Estimated population, 31 December 1971		Estimated population, 1 May 1970 (000)	Population, 1 May 1960 (000)	Estimated percent increase, 1960 to 1970	Population, 1 May 1950 (000)	Percent increase, 1950 to 1960
	Number (000)	Percent					
Total	9,925	100.0	9,550	7,387	29.3	5,707	29.4
Urban	3,145	31.7	3,020	1,876	61.0	1,324	41.7
Rural	6,780	68.3	6,530	5,511	18.5	4,383	25.7
Provinces	9,520	95.9	9,160	7,087	29.3	5,507	28.7
Urban	3,105	31.3	2,990	1,848	61.8	1,304	41.7
Rural	6,415	64.6	6,170	5,239	17.8	4,203	24.6
Northern Territory	405	4.1	390	300	30.0	200	50.0
Urban	40	0.4	32	27	18.5	20	36.5
Rural	365	3.7	358	273	31.1	180	51.1

Note: The 1970 and 1971 population estimates assume an annual growth rate of 2.6 percent since 1960, with adjustment for migration to urban areas. All figures for the Northern Territory are estimates by district officials.

Source for 1960 and 1950 data: 1960 and 1950 Censuses of Population for the Provinces.

Exhibit II-1-2. NUMBER OF DISTRICTS BY AVERAGE SIZE OF ENUMERATION AREAS FOR THE PROVINCES, URBAN AND RURAL: 1960

Province	Total number of districts	Urban								Rural[1]							
		Number of districts with average EA population --								Number of districts with average EA population --							
		Under 200	200 to 299	300 to 399	400 to 499	500 to 599	600 to 699	700 to 799	800 or more	Under 200	200 to 299	300 to 399	400 to 499	500 to 599	600 to 699	700 to 799	800 or more
Total	172	3	9	42	79	26	9	3	1	4	12	21	68	51	8	4	3
Bolivar	8	-	-	3	5	-	-	-	-	-	-	1	6	1	-	-	-
Dewar	12	-	-	5	7	-	-	-	-	-	-	3	6	3	-	-	-
DuBois	14	-	-	3	10	1	-	-	-	-	-	1	9	4	-	-	-
Hassam	9	-	-	2	6	1	-	-	-	-	-	-	6	3	-	-	-
Liberto	12	-	-	4	6	2	-	-	-	-	1	-	8	2	1	-	-
Lopez	20	-	-	3	12	2	3	-	-	-	-	3	4	8	2	-	2
Lo-San-Tho	11	1	2	5	1	1	1	-	-	-	1	4	4	2	-	-	-
Morgan	12	-	1	2	5	4	-	-	-	2	1	1	1	4	3	-	-
Paris	18	1	3	2	5	3	2	1	1	1	3	2	7	4	-	1	-
Rajpur	16	-	-	1	8	5	-	2	-	-	-	-	12	4	-	-	-
Rama	15	-	-	5	7	2	1	-	-	-	4	2	1	4	-	3	1
Tali	15	-	2	3	4	4	2	-	-	-	-	2	2	9	2	-	-
Valencia	10	1	1	4	3	1	-	-	-	1	2	2	2	3	-	-	-

- Entry represents zero.
[1]Excludes Calicut District, which is entirely urban.

Source: 1960 Census of Population for the Provinces.

Exhibit II-2-1. CALENDAR OF MAJOR CENSUS ACTIVITIES

(Applies to Provinces only; timing for the Northern Territory would be adjusted accordingly)

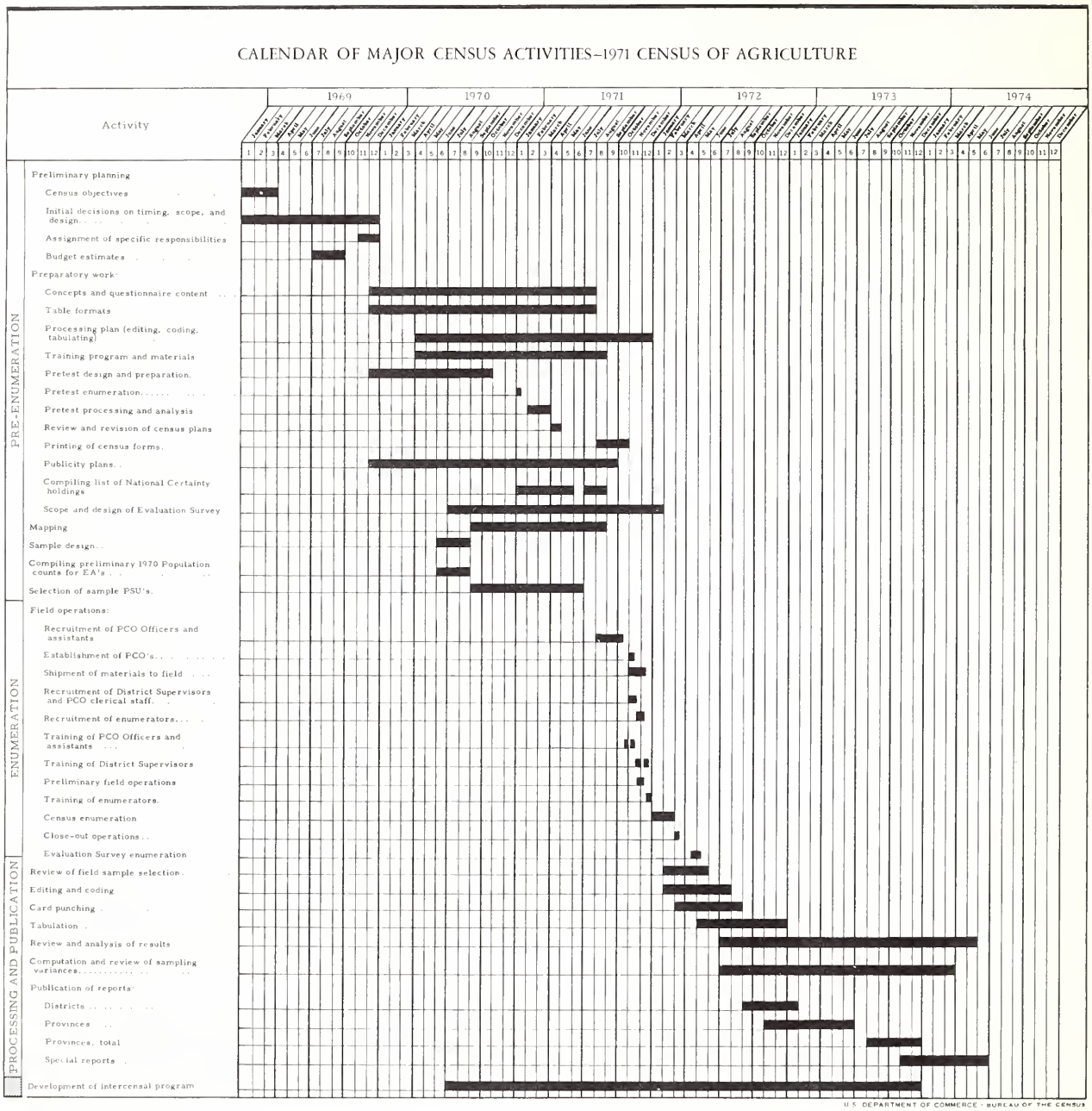


Exhibit II-2-2. ESTIMATED MAN-YEARS, BY MAJOR CENSUS ACTIVITY

Activity	Man-years	
	Number	Percent
Total	271.9	100.0
Planning and preparatory work	29.4	10.8
Field enumeration	149.8	55.1
Central office processing	52.5	19.3
Analysis and publication	26.4	9.7
General administrative and miscellaneous services	13.8	5.1

Exhibit II-2-3. BUDGET ESTIMATES FOR PERSONAL SERVICES AND OTHER COSTS, BY MAJOR CENSUS ACTIVITY

(Percent distribution)

Activity	Total	Personal services	Other
Total budgeted cost	100.0	76.4	23.6
Planning and preparatory work	14.2	12.0	2.2
Field enumeration	45.8	36.0	9.8
Central office processing	19.2	14.4	4.8
Analysis and publication	12.2	10.2	2.0
General administrative and miscellaneous services	8.6	3.8	4.8

Exhibit II-2-4. BUDGET ESTIMATES FOR CALENDAR YEARS, BY MAJOR CENSUS ACTIVITY

(Percent distribution)

Activity	Total	Calendar year					
		1969	1970	1971	1972	1973	1974
Total budgeted cost	100.0	2.6	8.3	14.5	54.2	18.3	2.1
Planning and preparatory work	14.2	1.8	[1]5.4	7.0	-	-	-
Field enumeration	45.8	-	0.8	[2]4.0	41.0	-	-
Central office processing[3]	19.2	-	-	1.1	7.3	9.9	0.9
Analysis and publication[3]	12.2	-	-	0.2	3.8	7.6	0.6
General administrative and miscellaneous services	8.6	0.8	2.1	2.2	2.1	0.8	0.6

[1]Estimates assume that much of the cost of basic map preparation was charged to the 1970 Census of Population and Housing.

[2]Includes cost of enumeration in the Northern Territory in November-December 1971 and the pretest in the Provinces in January 1971.

[3]Excludes planning.

Exhibit II-2-5. REPORT ON ENUMERATION PROGRESS, FORM A-255

Form A-255
AGROSTAN
(April 1971)

MINISTRY OF ECONOMY
National Statistical Office

REPORT ON ENUMERATION PROGRESS

1971 CENSUS OF AGRICULTURE

Item	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____
PROVINCE (ZONE) _____												
Number of districts												
Total number of PSU's												
PSU's assigned												
PSU's with listing completed												
PSU's with A-1's completed												
Total number of National Certainty holdings												
National Certainty holdings assigned												
National Certainty A-1's completed												
PROVINCE (ZONE) _____												
Number of districts												
Total number of PSU's												
PSU's assigned												
PSU's with listing completed												
PSU's with A-1's completed												
Total number of National Certainty holdings												
National Certainty holdings assigned												
National Certainty A-1's completed												
PROVINCE (ZONE) _____												
Number of districts												
Total number of PSU's												
PSU's assigned												
PSU's with listing completed												
PSU's with A-1's completed												
Total number of National Certainty holdings												
National Certainty holdings assigned												
National Certainty A-1's completed												

U.S. DEPARTMENT OF COMMERCE - BUREAU OF THE CENSUS

Exhibit II-2-6. REPORT ON FIELD COSTS, FORM A-256

Form A-256
AGROSTAN
(April 1971)

MINISTRY OF ECONOMY
National Statistical Office

REPORT ON FIELD COSTS

1971 CENSUS OF AGRICULTURE

Item	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____	Totals for period ending _____
PROVINCE (ZONE) _____												
Total payments	$	$	$	$	$	$	$	$	$	$	$	$
Enumerator: Training												
PSU listing												
PSU A-1's												
National Certainty A-1's												
Travel allowance												
Supervisor: Salaries												
Travel allowance												
PCO (TCO): Office salaries												
Other authorized payments												
PROVINCE (ZONE) _____												
Total payments	$	$	$	$	$	$	$	$	$	$	$	$
Enumerator: Training												
PSU listing												
PSU A-1's												
National Certainty A-1's												
Travel allowance												
Supervisor: Salaries												
Travel allowance												
PCO (TCO): Office salaries												
Other authorized payments												
PROVINCE (ZONE) _____												
Total payments	$	$	$	$	$	$	$	$	$	$	$	$
Enumerator: Training												
PSU listing												
PSU A-1's												
National Certainty A-1's												
Travel allowance												
Supervisor: Salaries												
Travel allowance												
PCO (TCO): Office salaries												
Other authorized payments												

U.S. DEPARTMENT OF COMMERCE - BUREAU OF THE CENSUS

Exhibit II-2-7. SUMMARY REPORT ON ENUMERATION, PROCESSING, AND PUBLICATION PROGRESS

(Can be set up as a wall chart or in report form for periodic distribution; similar reports can be prepared for the Northern Territory)

SUMMARY REPORT ON ENUMERATION, PROCESSING, AND PUBLICATION PROGRESS

Total number of:

Districts ________

Sample PSU's ________

NC holdings ________

Period ending—	ENUMERATION						PROCESSING																				ANALYSIS AND PUBLICATION (percent completed)		
	PSU's with—				N C holdings enumerated		RECEIVED				EDITED AND CODED						A-1's COLLATED FOR PUNCHING				PUNCHED AND VERIFIED				TABULATED (percent)	Review and analysis of results	Preparation of final reports	Publication of final reports
	Listings completed		A-1's completed				PSU's		N C holdings		Districts		PSU's		N C holdings		Districts		PSU's		Districts		PSU's					
	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent	Number	Per-cent				

U.S. DEPARTMENT OF COMMERCE · BUREAU OF THE CENSUS

Exhibit II-2-8. SUMMARY REPORT ON FIELD AND CENTRAL NSO COSTS

(Can be set up as a wall chart or in report form for periodic distribution; similar reports can be prepared for the Northern Territory)

SUMMARY REPORT ON FIELD AND CENTRAL NSO COSTS

Period ending—	TOTAL		FIELD		NSO																	
					Total		Planning and preparatory work		PROCESSING								ANALYSIS AND PUBLICATION					
									Receipt, distribution, and control		Editing and coding		Punching and verification		Tabulation		Review and analysis of results		Preparation of final reports		Publication of final reports	
	Amount	Per-cent*	Amount	Per-cent*	Amount	Per-cent*	Amount	Per-cent*	Amount	Per-cent*	Amount	Per-cent*	Amount	Per-cent*	Amount	Per-cent*	Amount	Per-cent*	Amount	Per-cent*	Amount	Per-cent*
	$		$		$		$		$		$		$		$		$		$		$	

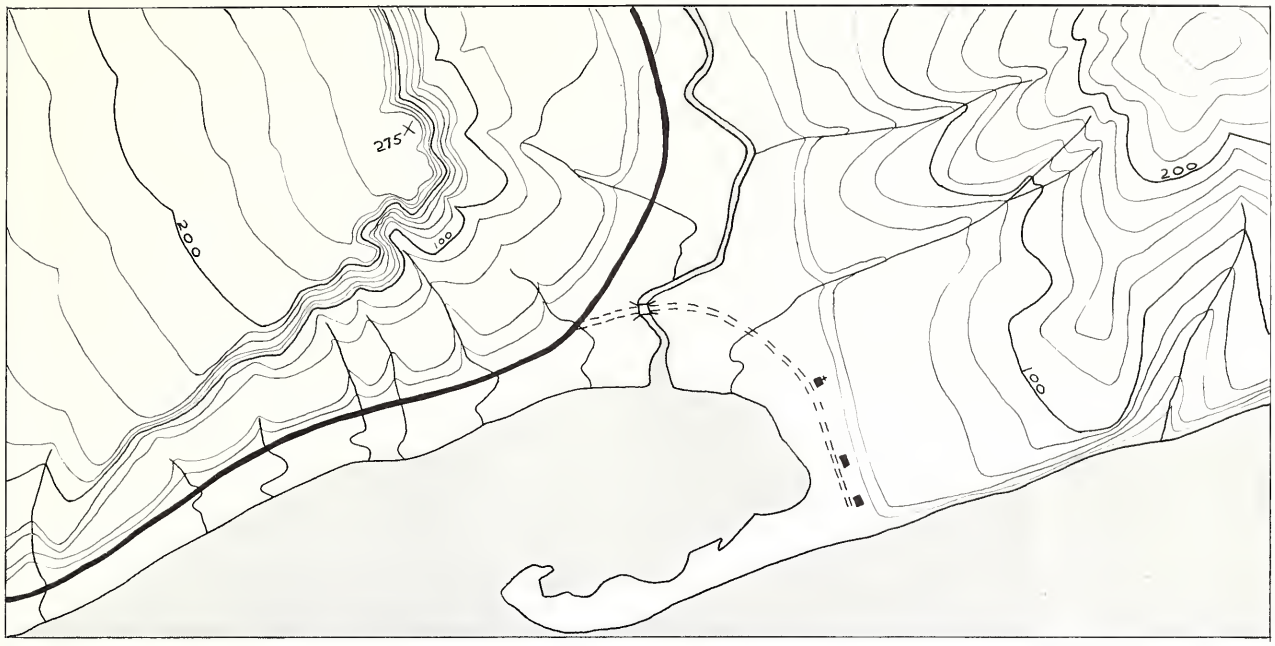
* PERCENT OF BUDGETED AMOUNT FOR ACTIVITY.

Exhibit II-3-1. EXAMPLE OF AN AERIAL PHOTOGRAPH AND A MAP

Note: The tracing lacks north arrow, names, boundaries, and location of houses and other structures.

Exhibit II-3-2. EXAMPLE OF A CONTOUR MAP AND A HIGHWAY MAP

Contour map



Contour interval equals 20 feet.

Highway map showing culture

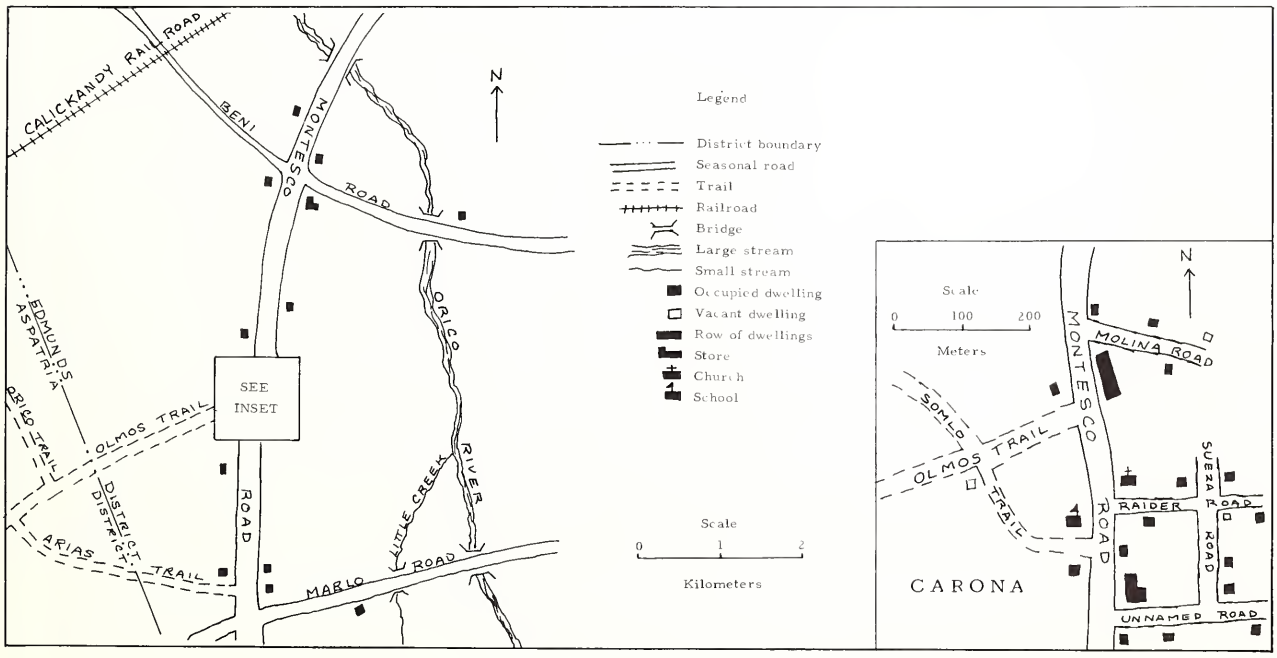
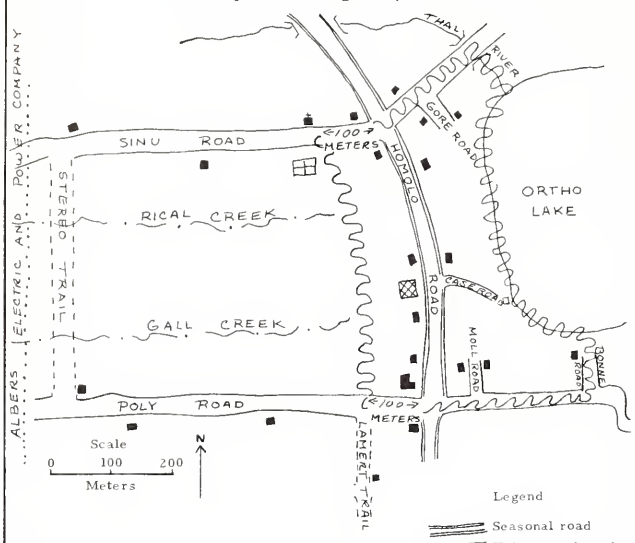


Exhibit II-3-3. EXAMPLES OF MAP FEATURES, RIGHT AND WRONG

RIGHT

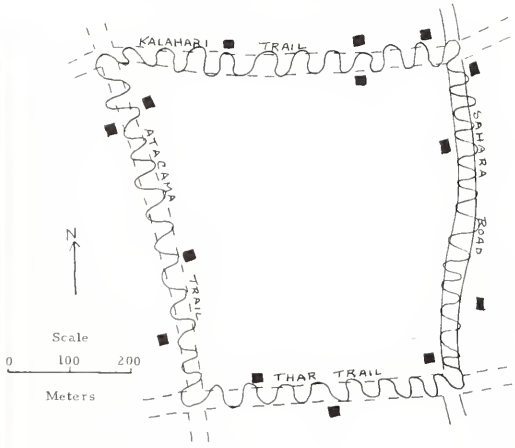
Example 1: Imaginary lines



Legend
- Seasonal road
- Unimproved road
- Trail
- Transmission line
- Bridge
- Stream
- Intermittent stream
- Dwelling
- Church
- Cemetery
- Store
- Industry
- Enumeration area boundary

An imaginary line is used as the western boundary; it runs parallel to Homolo Road, and the distance from this visible feature is indicated. Its starting and ending points can also be associated with other visible features. The southeast boundary, Bonne Road, is extended for a short distance to connect with the lake.

Example 2: Road boundaries

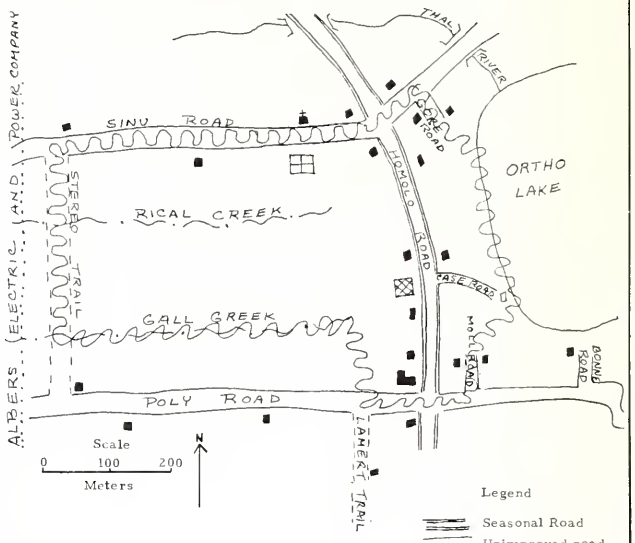


Legend
- Unimproved road
- Trail
- Dwelling
- Enumeration area boundary

Roads are shown by double lines. The enumerator can interpret the boundary clearly.

WRONG

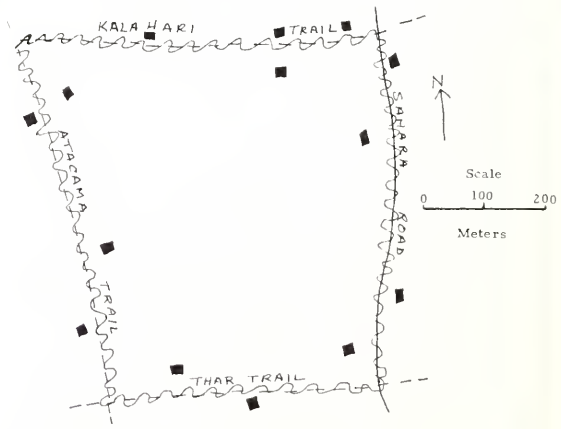
Example 1: Imaginary lines



Legend
- Seasonal Road
- Unimproved road
- Trail
- Transmission line
- Bridge
- Stream
- Intermittent stream
- Dwelling
- Church
- Cemetery
- Store
- Industry
- Enumeration area boundary

There are four boundary errors on this map. First, the imaginary line used as a boundary from Lamert Trail does not have a visible feature at its northern end and the distance from Homolo Road is not indicated. Second, Gall Creek is an intermittent stream and may be hard to locate during the dry season. Third, an extension of Gore Road is made a boundary line when nearby Thal River could be used. Last, the extension of Moll Road is curved and difficult to locate on the ground.

Example 2: Road boundaries



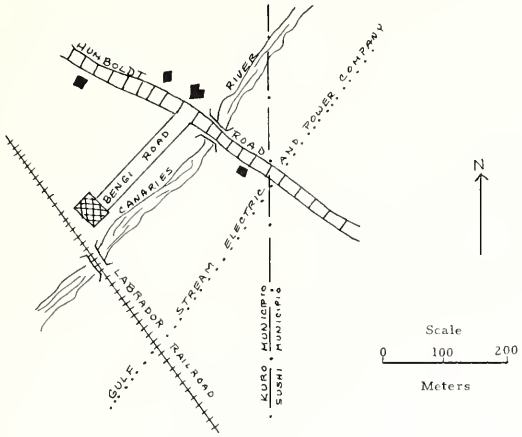
Legend
- Unimproved road
- Trail
- Dwelling
- Enumeration area boundary

Roads are shown by single lines. The enumerator may not be sure whether he should canvass one side or both sides of the road. This is not necessarily incorrect. Single lines can be used, if the costs of preparing double-line road maps are too high.

Exhibit II-3-3. EXAMPLES OF MAP FEATURES, RIGHT AND WRONG--Continued

RIGHT

Example 3: Map information and reproduction

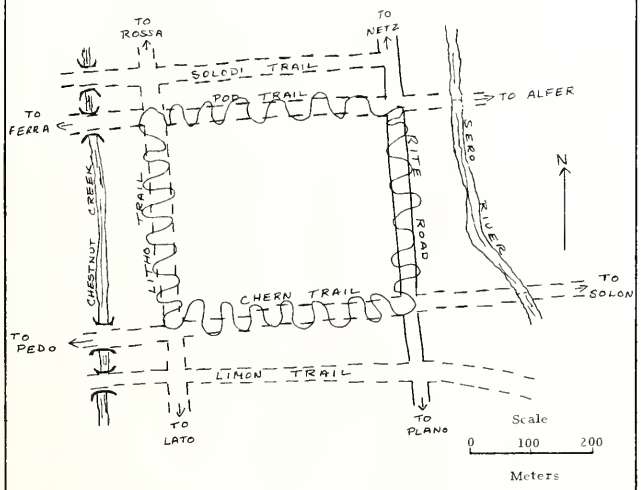


Map has north arrow, scale and legend. All places are named; map is legible and can be reproduced.

Legend

- District boundary
- Hard surface road
- Unimproved dirt road
- Railroad
- Bridge
- River
- Transmission line
- Dwelling
- Industry
- Store

Example 4: Periphery information



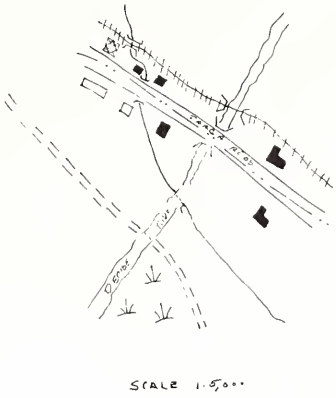
Enough information is provided on the map so that the enumerator can find the area and easily recognize the boundaries.

Legend

- Unimproved road
- Trail
- Culvert
- Ford
- Stream
- Enumeration area boundary

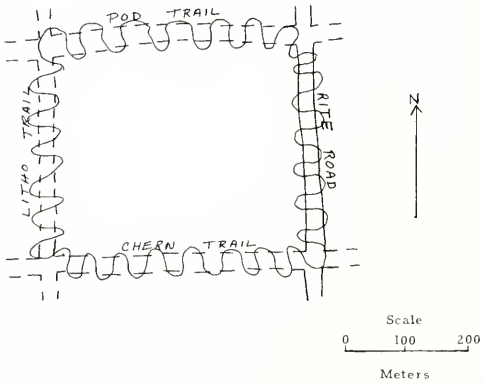
WRONG

Example 3: Map information and reproduction



Printing on the map is blurred and will not reproduce clearly. Many features are unnamed. Map has no north arrow or legend. Names are too small to be read easily. Scale representation is hard to understand and use.

Example 4: Periphery information



No information is shown for the peripheral area. The enumerator may have difficulty in finding his boundary lines. There is also no indication of the location of nearby towns.

Legend

- Unimproved road
- Trail
- Enumeration area boundary

Exhibit II-3-4. EXAMPLE OF A SUBDIVIDED SAMPLE PSU

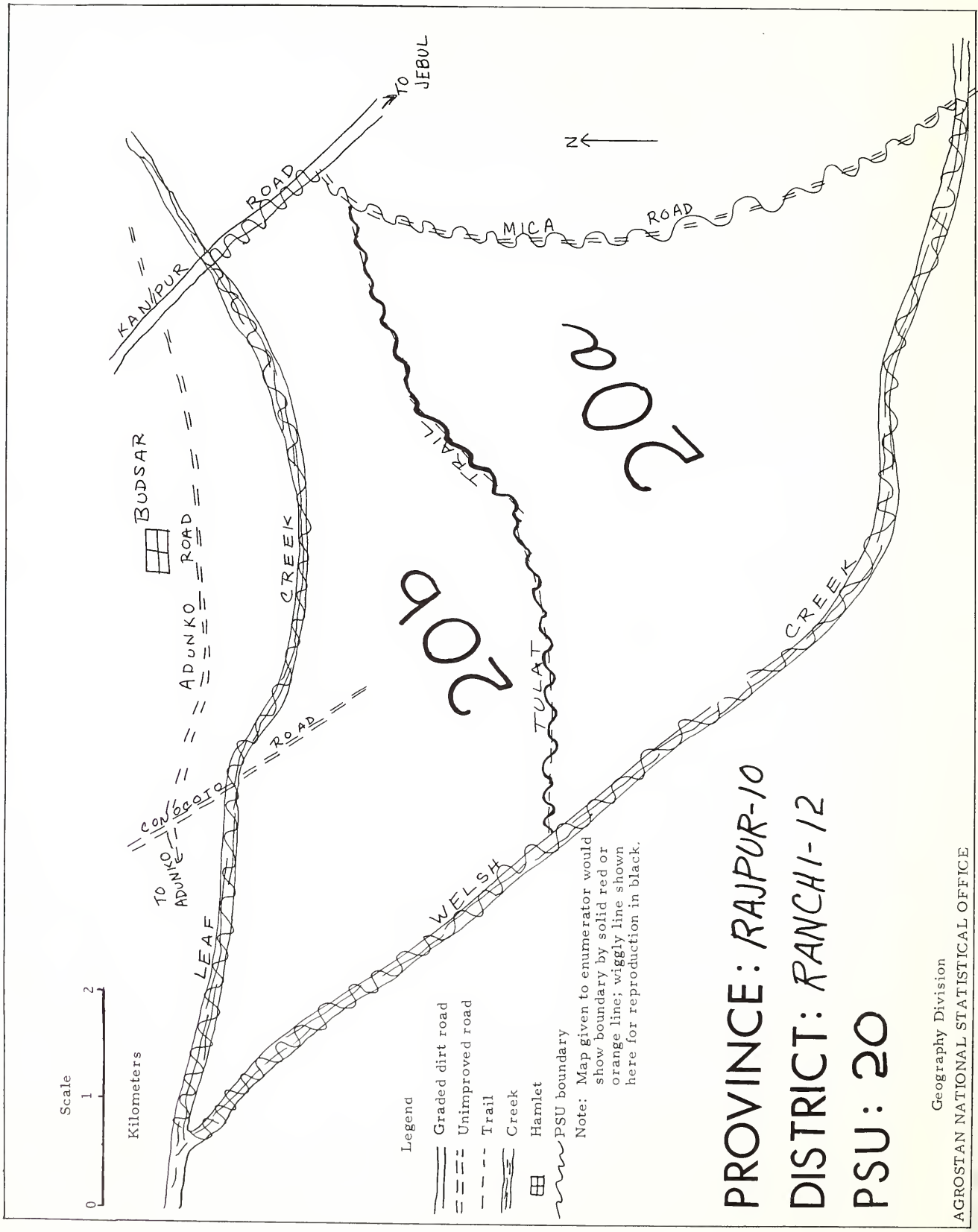


Exhibit II-3-5. ENUMERATOR'S MAP FOR A SAMPLE PSU

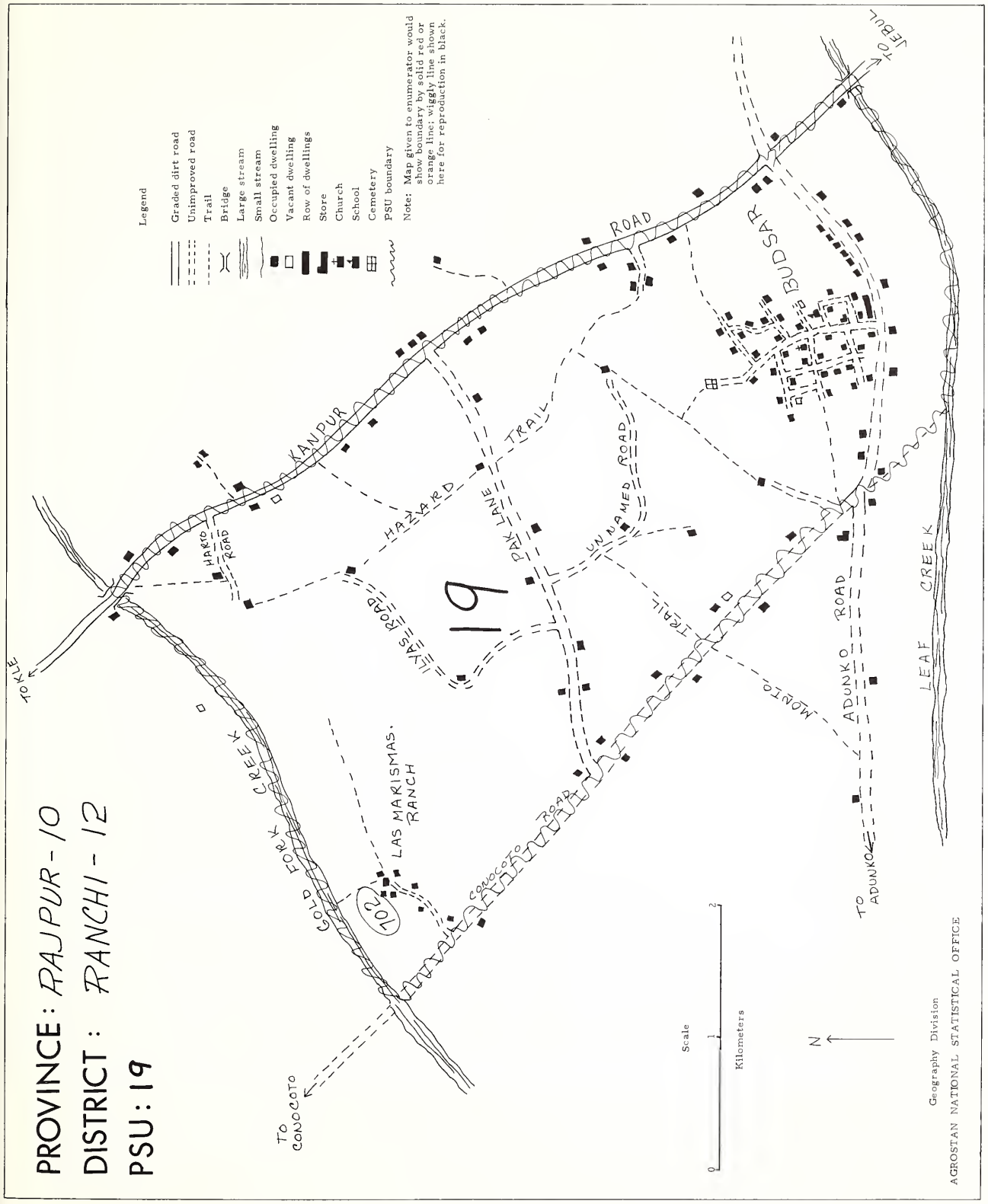


Exhibit II-3-6. DISTRICT MAP SHOWING SAMPLE PSU'S AND LOCATION OF NATIONAL CERTAINTY HOLDINGS

(PSU's that were subdivided are those with cross-hatching on the portion not to be enumerated)

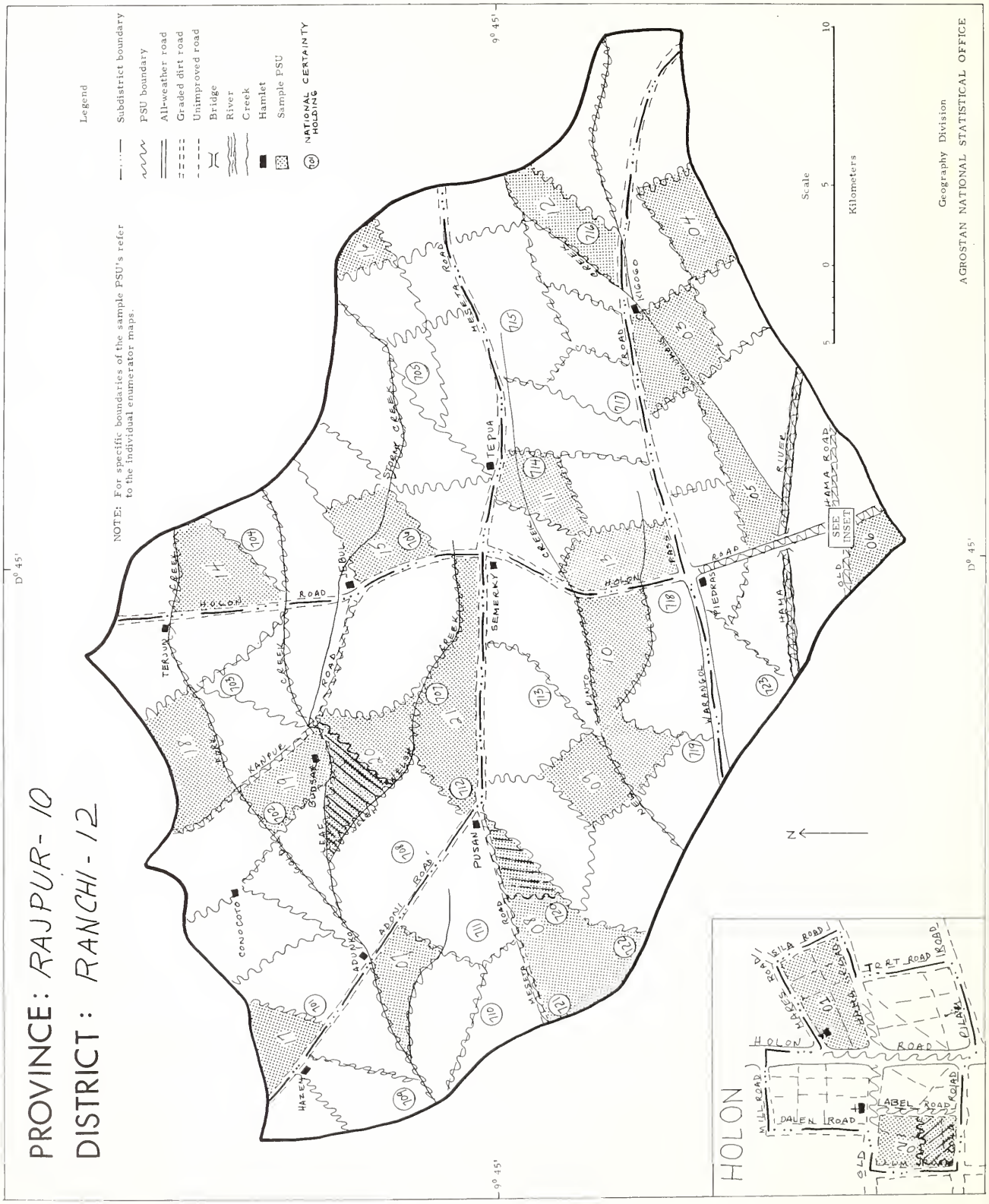


Exhibit II-3-7. EXAMPLES OF ANALYTICAL MAPS

Figure 1. Percent of change in total population, for the Provinces: 1960 to 1970

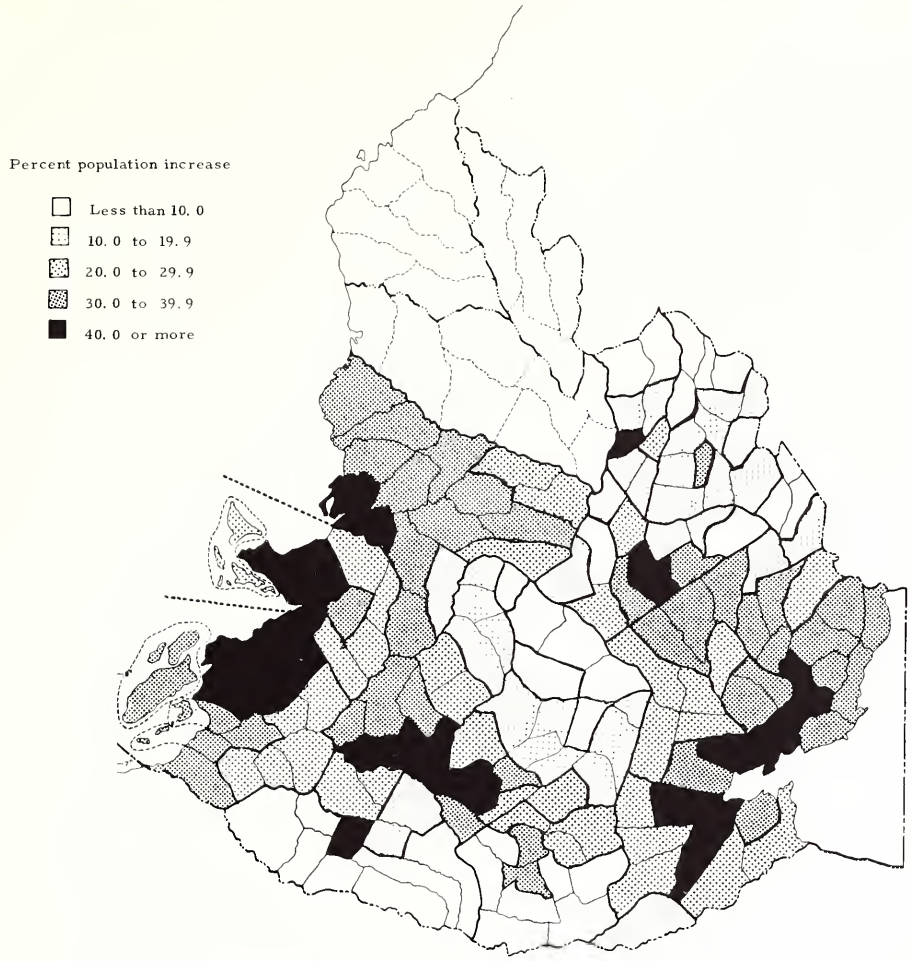


Figure 2. Land utilization for the Provinces: 1971 and 1961

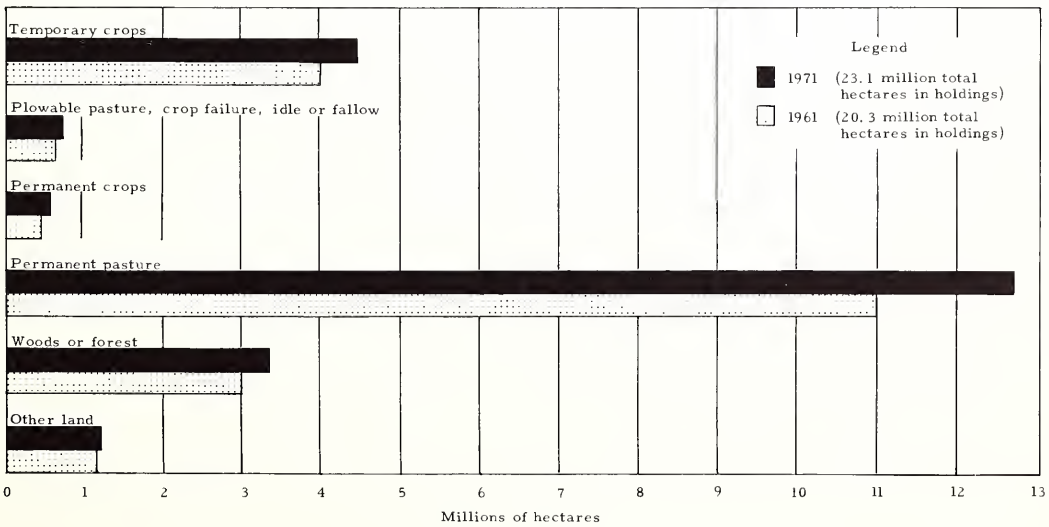


Exhibit II-3-7. EXAMPLES OF ANALYTICAL MAPS--Continued

Figure 4. Hectares of wheat harvested, for the Provinces and Northern Territory: 1971

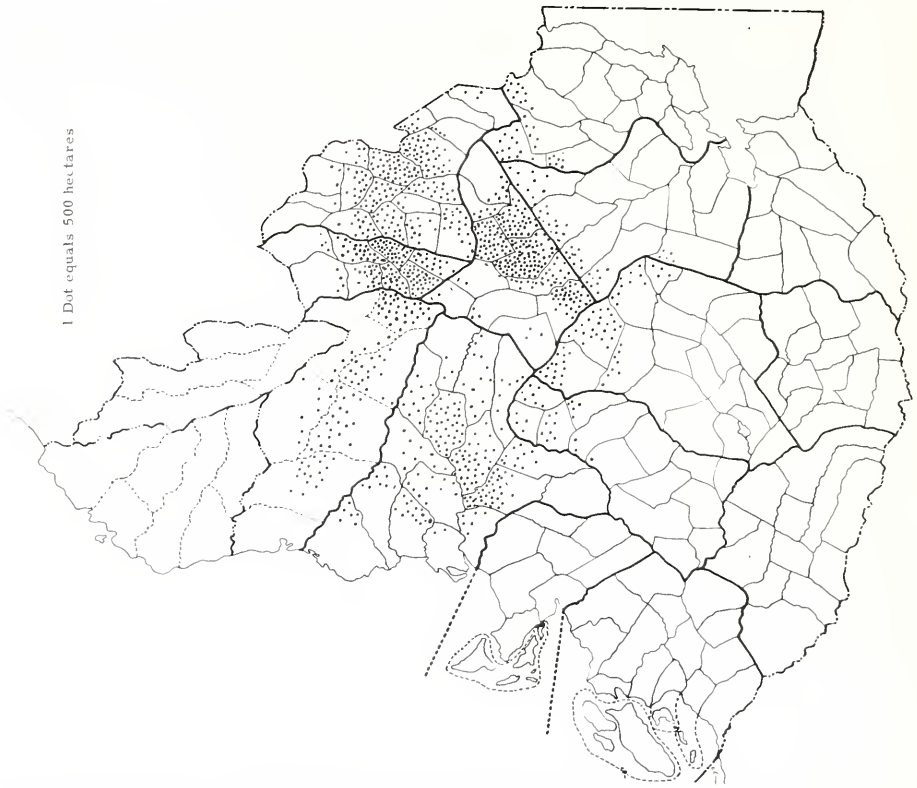
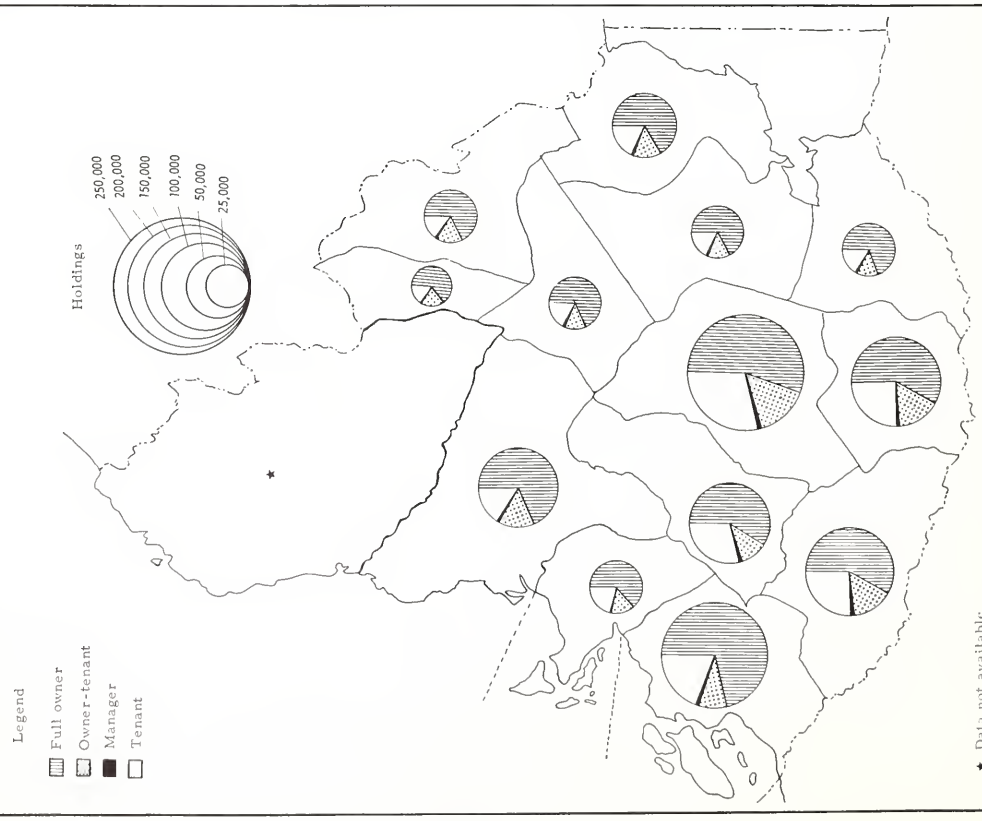


Figure 3. Tenure of holdings, for the Provinces: 1971



OTHER EXHIBITS FOR REFERENCE

(Exhibits from other units of the case study that are referred to in Unit II appear on the following pages)

Exhibit I-3-2. ORGANIZATION OF THE NATIONAL STATISTICAL OFFICE FOR THE 1970 CENSUS PROGRAM

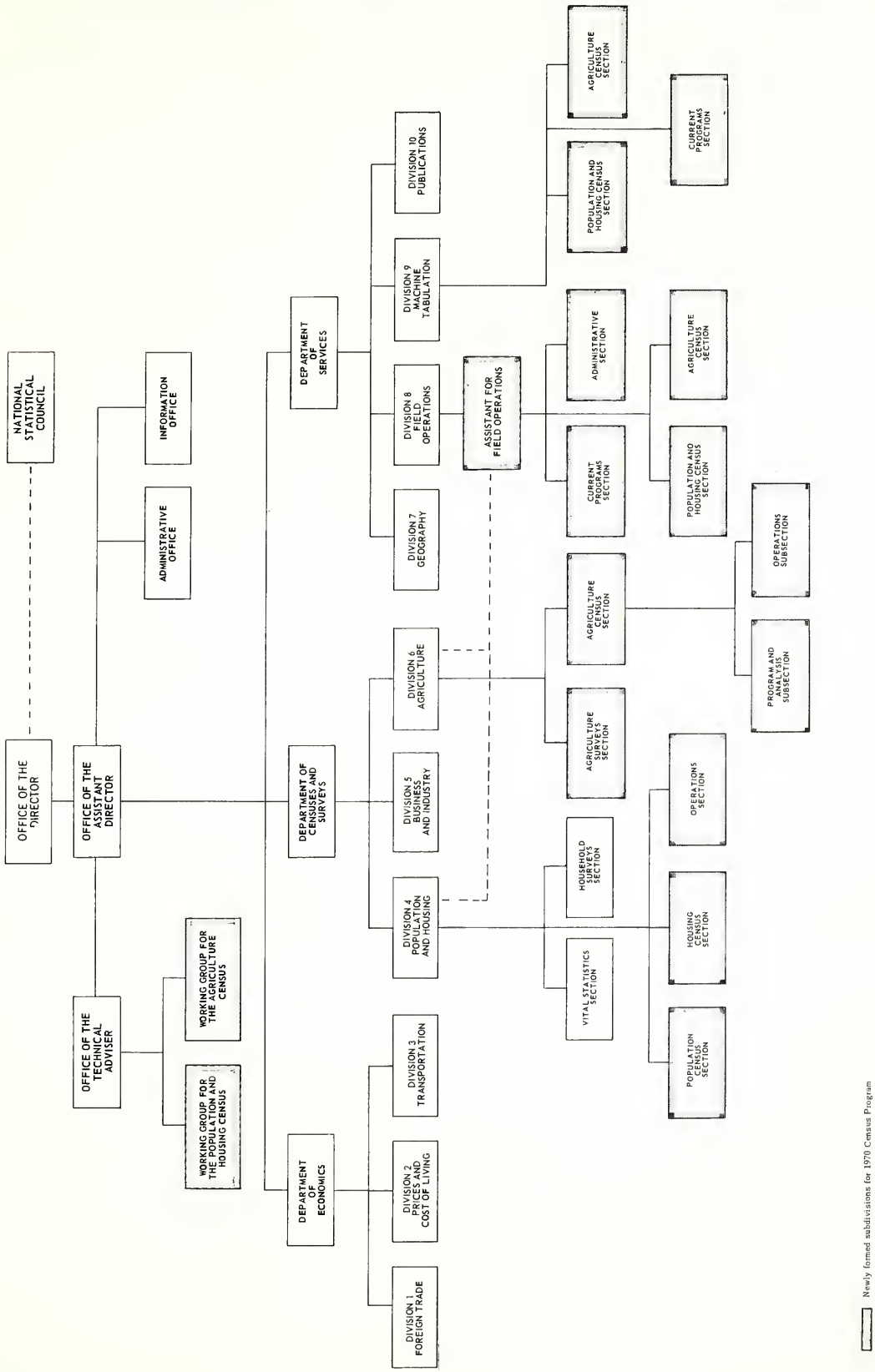
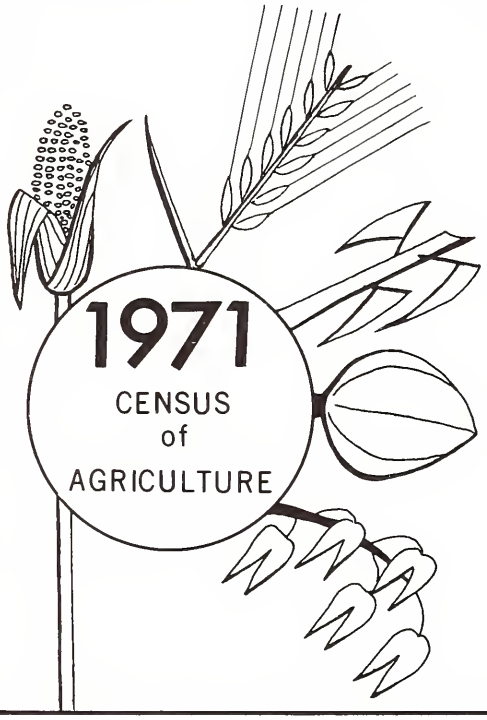


Exhibit V-1-1. RECRUITMENT ANNOUNCEMENT, NOTICE OF TRAINING, AND IDENTIFICATION CARD

RECRUITMENT ANNOUNCEMENT

(To be posted or announced by radio or newspaper; if posted, would be printed in color)

AGROSTAN



YOUR GOVERNMENT NEEDS

YOU

AS CENSUS TAKER

PLEASE APPLY AT THE TEMPORARY CENSUS OFFICE

IN _____ ON _____
(place) (date)

NOTICE OF TRAINING

Form A-107
(JUNE, 1971)

MINISTRY OF ECONOMY
AGROSTAN
NATIONAL STATISTICAL OFFICE

You have been accepted for a position as _____ in the 1971 Census of Agriculture. Please report for training at the temporary Census Office in:

_____ on _____
(place) *(date)*

at _____
(time)

_____
(Census supervisor)

1971 CENSUS OF AGRICULTURE

IDENTIFICATION CARD

MINISTRY OF ECONOMY
AGROSTAN
NATIONAL STATISTICAL OFFICE

1971 CENSUS OF AGRICULTURE

CENSUS EMPLOYEE

MINISTRY OF ECONOMY AGROSTAN

Form A-203
(JUNE, 1971)

OFFICIAL CREDENTIAL

(Employee's signature)

Exhibit V-1-2. APPLICATION AND PERSONNEL FORM FOR TEMPORARY FIELD SERVICE, FORM A-200

(Forms would be prepared in sets of white, yellow, and pink copies)

Form A-200 (AGROSTAN)
(March 1971)

MINISTRY OF ECONOMY
NATIONAL STATISTICAL OFFICE

APPLICATION AND PERSONNEL FORM FOR FIELD SERVICE
1971 CENSUS OF AGRICULTURE

Appointed for
1971 Census of Agriculture

INSTRUCTIONS – This form will be used only for employees for major censuses. Appointments may not exceed 6 months. All entries, except signatures, must be made by typewriter or printed with heavy pressure by ballpoint pen. All copies must be legible.

Part A – APPLICATION
(To be completed by applicant)

1. Name *(Surname – given name) PLEASE PRINT*

2. Home address *(Road, city or hamlet, or other description of location, District)*

3. Province

4. Date of birth *(Day, month, year)*

5. Telephone No.

6. Have you had previous civilian government service?
☐ Yes → Agency _____
☐ No Dates of service from _____ to _____

Answer by placing "X" in appropriate column	Yes	No
7. Are you a citizen of Agrostan? *If No, give country of which you are a citizen.* _____		
8. Do you now have any physical defect or disability? *If Yes, explain in item 17.*		
9. Are you now employed? *If Yes, give name of employer, type of work, hours of work, salary, etc. in item 17.*		
10. Have you ever been discharged (fired) from a job, or have you quit after being informed that your employer intended to discharge (fire) you? *If Yes, give in item 17 the name and address of employer, date, and reason in each case.*		
11. Have you been arrested since your 16th birthday? *If Yes, give in item 17 the date, charge, place, and action taken in each case.*		
12a. Are you now, or were you in the past, an operator, a family worker, or a hired worker on an agricultural holding?		
b. Have you had any previous experience working in an office?		
If Yes to a or b above, give details. _____		
13. Are you willing to work full days, 6 days a week? *If No, explain.* _____		
14. Do you understand that this work must be done during a specified period, not when you want to do it?		

15. Education – *Circle highest year completed.*

Elementary								Secondary				University			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

16. Indicate your knowledge of languages or dialects by entering "E" for excellent, "G" for good, or "F" for fair opposite each.

Language or dialect	Reading	Speaking	Understanding	Writing

17. Remarks

18. I certify that the statements made in this application are true to the best of my knowledge and belief.
Applicant's signature _____ Date _____

Part B – NOTICE OF PERSONNEL ACTION
(To be completed by supervisor)

19. Temporary appointment ☐ Enumerator ☐ Office worker ☐ Supervisor ☐ Other
(Rate of pay shown in item 25)

This appointment is subject to conditions outlined below. It may be terminated at any time within 6 months. It may be terminated without further written notice at the close of the last day you are assigned to duty.

20. APPOINTMENT AUTHORITY: Amendment 1(1953), Census and Statistics Act of 1948

21. AGENCY CODE: NSO(068) Ministry of Economy

22. Place of work: Province; District; City *(If applicable)*

23. Effective date of appointment: Day, month, year

24. Compensation from: 1971 Census of Agriculture

25. Remarks and salary rates – *Insert rates of pay appropriate for the type of appointment indicated in item 19.*

	Rates
☐ a. Enumerator	
(1) Training (fee)	
(2) PSU listing (each)	
(3) PSU enumeration (each)	
(4) National Certainty enumeration (each)	
(5) Travel (fee)	
☐ b. Supervisor	
(1) Daily salary	
(2) Travel (per kilometer)	
☐ c. Office workers	
(1) Daily salary	
(2) Travel *(If applicable)*	
☐ d. Other – *Specify duties and rates*	
(1) _____	
(2) _____	

26. Appointing officer's signature _____ Date _____

Part C – OATH AND APPOINTMENT AFFIDAVITS

27. I have read the Oath and Appointment Affidavits and I hereby swear (or affirm) to them as prescribed by the National Statistical Office.
Appointee's signature _____

28. *(To be completed by person administering oath)*
Subscribed and sworn (or affirmed) before me this ____ day of ____, 19__ A.D. at _____ (Place) _____ (Province)

Officer's signature _____

Title _____

I have been designated to administer oaths under Section _____, Act of _____

Personnel folder (White) Employee (Yellow) NSO payroll (Pink) U.S. DEPARTMENT OF COMMERCE – BUREAU OF THE CENSUS

Exhibit V-1-3. ENUMERATOR SELECTION AID, FORM A-201

Form A-201 (AGROSTAN)
(March 1971)

MINISTRY OF ECONOMY
NATIONAL STATISTICAL OFFICE

ENUMERATOR SELECTION AID
1971 CENSUS OF AGRICULTURE

DO NOT USE	
Number right	
Parts I and II	
Parts III and IV	

A. Name *(Surname – given name) Please PRINT*	C. Year of birth
B. Address	D. Date of test

GENERAL INSTRUCTIONS

This test contains questions on map reading, arithmetic, and vocabulary. The questions need not be answered in order. Answer first those that you can without delay. Then go back and answer those questions you passed over. Give an answer to all questions even though you are not sure your answer is correct. A perfect score is not required in order to be eligible.

There are two ways to answer questions on this test. The first is to put your answer in the space provided. For example:

I. Multiply 4 x 7 : Answer 28

The correct answer is **28,** and is written in the space provided.

The second way to give an answer is to select the letter which represents the correct answer and enter that letter in the space provided. For example, you are instructed to select the word which means the same as the word in capital letters.

II. The National Statistical Office will HIRE people to take the Census of Agriculture:

A – help
B – train
C – employ
D – want
E – allow

Answer C

The correct answer for this question is **employ,** represented by the letter "C." You should enter "C" in the answer space.

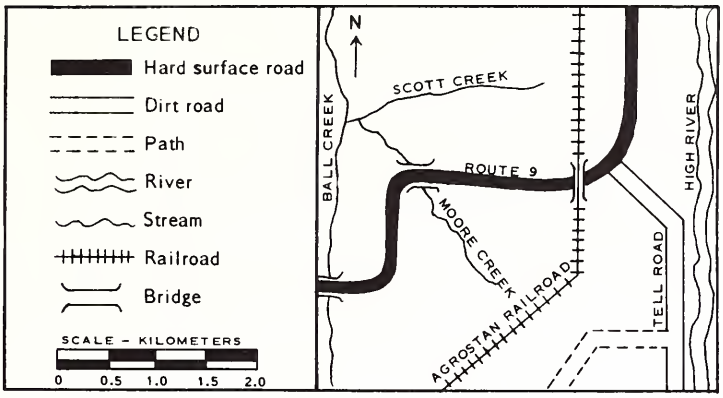
TIME ALLOWED – 90 Minutes

U.S. DEPARTMENT OF COMMERCE – BUREAU OF THE CENSUS

Exhibit V-1-3. ENUMERATOR SELECTION AID, FORM A-201--Continued

Part I – MAP READING

Read each question carefully and enter your answer in the space provided (or on the map as instructed).



1. What natural feature follows the eastern border of the map? . . . . . Answer_____

2. What is the straight-line distance (to the nearest whole kilometer) from the bridge over Moore Creek to the intersection of Route 9 and Tell Road? (Use scale and pencil or other straight edge to measure distance.) . . . . . Answer_____

3. How many bridges are within 1 kilometer of the western border of the map? (Use scale and pencil or other straight edge to measure distance.) . . . . . Answer_____

4. What is the straight-line distance (to the nearest whole kilometer) from the eastern end of Scott Creek to the railroad bridge over Route 9? (Use scale and pencil or other straight edge to measure distance.) . . . . . Answer_____

5. On the map above, draw arrows (→) to indicate the direction of travel you would take if you walked south on Tell Road from Route 9, then turned west onto the path and followed it to edge of the map . . . . . Answer On map

Exhibit V-1-3. ENUMERATOR SELECTION AID, FORM A-201--Continued

Part II – ARITHMETIC

Read each question carefully and enter your answer in the space provided.

6. A respondent says he owns 3-3/10 hectares of land, rents 1-6/10 hectares from a neighbor, and uses 7/10 of a hectare that is assigned to him by the community. Assuming he uses all this land, what is the total amount he uses? . . . . . Answer_____

7. A respondent tells you he owned 6-3/10 hectares of land, but he purchased an additional 4-6/10 hectares. He later sold 3-5/10 hectares. How many hectares does he own now? . . . . . Answer_____

8. A respondent reports his sales from crops were $2740 and sales from livestock were $1760. Which one of the following catagories would you check for the sale of all agricultural products?

   A – Over $6000
   B – $5000 to $5999
   C – $2500 to $4999
   D – Less than $2500 . . . . . Answer_____

9. A respondent says he sold 40 quintals of rice which was one-fourth the total amount harvested. What was the total amount harvested? . . . . . .Answer_____

10. Subtract 3287 −194

    Answer _____

11. Multiply 37 x 83

    Answer _____

12. Add 427 212 74 129

    Answer _____

13. Divide 672 by 168

    Answer _____

SPACE FOR CALCULATIONS

Exhibit V-1-3. ENUMERATOR SELECTION AID, FORM A-201--Continued

Part III – VOCABULARY

For each question choose the one answer which BEST fits the meaning of the word in capital letters; then mark the letter which corresponds to your answer in the space provided.

14. Do not PERMIT anyone but NSO employees to see the completed census forms.

A – forbid
B – encourage
C – allow
D – command
E – require

Answer _____

15. Census information remains CONFIDENTIAL.

A – essential
B – important
C – interesting
D – reliable
E – secret

Answer_____

16. He was RELUCTANT to answer the question.

A – unable
B – unwilling
C – unqualified
D – anxious
E – pleased

Answer_____

17. John gets $20 a week in WAGES

A – pay
B – rent
C – interest
D – dividends
E – bonds

Answer_____

Part IV – READING

Questions 18 and 19 refer to the following statement.

> The phrase "keep livestock" refers to all livestock and poultry on a holding (at the time of enumeration) regardless of ownership. It also includes livestock owned by the holder if they are on common or public grazing land.

Following this rule, should you include the livestock for the situations given below? Write "yes" or "no" in the answer space provided.

18. Mr. Ali says there are 20 sheep on his holding but they are owned by his neighbor. Should you include the sheep on Mr. Ali's holding? . . . . . Answer_____

19. Mr. Wong tells you he has 10 cows on his holding and 12 cows on common grazing land. Should you report all 22 cows on Mr. Wong's holding? . . . . . Answer_____

20. Family income includes all income received by the head of household and all persons living in his household who are related to him. Income refers to gross cash income from all sources, before deductions for taxes etc.

Which of the following is NOT considered as family income?

A – Cash received by head of household for sale of livestock.
B – Wages received by son of head for working after school.
C – Cash rent received for rent of 4 hectares of land.
D – Salary received by unrelated lodger who works as a teacher.
E – Monthly pension payments to head of household's father.

Answer_____

Exhibit V-1-4. ANSWER KEY TO ENUMERATOR SELECTION AID, FORM A-202

Form A-202 (AGROSTAN)
(March 1971)

MINISTRY OF ECONOMY
NATIONAL STATISTICAL OFFICE

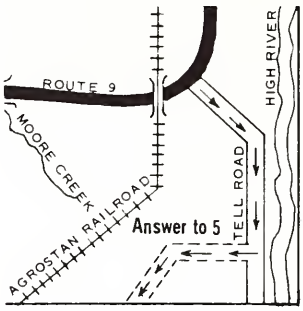
ANSWER KEY TO ENUMERATOR SELECTION AID (Form A-201)

1971 CENSUS OF AGRICULTURE

INSTRUCTIONS TO EXAMINER – If the applicant clearly indicates by his answer in the booklet that he knows the correct answer even though he expresses it in some way other than shown in the scoring key, mark the question correct. Persons failing to earn at least the minimum score are rated ineligible.

Part I :

1 – River (High River)
2 – 2 kilometers
3 – 2
4 – 1 kilometer
5 – on map



Part II :

6 – 5-6/10 (5.6 or 5-3/5)
7 – 7-4/10 (7.4 or 7-2/5)
8 – C
9 – 160 quintals
10 – 3093
11 – 3071
12 – 842
13 – 4

Part III :

14 – C
15 – E
16 – B
17 – A

Part IV :

18 – Yes
19 – Yes
20 – D

U.S. DEPARTMENT OF COMMERCE – BUREAU OF THE CENSUS

Exhibit V-2-15. PROBLEM REFERRAL, FORM A-101

(Forms would be prepared in sets of three copies each)

Form A-101 (AGROSTAN)
(March 1971)

MINISTRY OF ECONOMY
NATIONAL STATISTICAL OFFICE

PROBLEM REFERRAL
1971 CENSUS OF AGRICULTURE

SEE INSTRUCTIONS ON REVERSE

A. Routing

FROM *(Name)* ☐ NSO ☐ Supervisor ☐ PCO (TCO) ☐ Enumerator

TO *(Name)* ☐ NSO ☐ Supervisor ☐ PCO (TCO) ☐ Enumerator

B. Province or zone | Code | **C.** Date

Fill as applicable

D. District | Code | **E.** PSU No.

PROBLEM - Answer required: ☐ Yes ☐ No

ATTACHMENTS: ☐ Yes *(Describe)* ☐ No

ANSWER:

Answered or acknowledged by | Date

Referred for reply to | Date

Original and 1st copy - Receiver **2nd copy** - Originator U.S. DEPARTMENT OF COMMERCE - BUREAU OF THE CENSUS

Exhibit V-2-15. PROBLEM REFERRAL, FORM A-101--Continued

INSTRUCTIONS

The Problem Referral sheet is to be used to make inquiries or to report problems. Prepare original and two carbon copies; enter only one message per set.

Problem

State the problem as concisely as possible, but give all necessary details. Include your recommendations, if any, on how problem should be handled and attach forms, maps, notes, etc., as appropriate. Examples of messages or problems to be included are:

1. Questions on procedures or administrative matters.
2. Inadequacies or errors on maps or problems on boundaries.
3. Clarification of instructions.
4. Report on refusals, either complete or partial.
5. Inadequacies in work being returned for correction.

Attachments

If materials are attached to the Problem Referral, check "Yes" and list all materials; identify thoroughly.

Answer

If the problem is in the form of a question, receiver will enter reply here and enter name and date below. If problem concerns the return of work for correction or does not require a reply, receiver will acknowledge the message by entering name and date.

Distribution of Problem Referral sheets

The originator will write his message or question in the "Problem" section. He will keep the second carbon copy and transmit the other two copies to the receiver. The originator's copy will serve as a record of the initial inquiry in case a followup for reply is necessary.

The receiver will enter his reply or acknowledge receipt of the message on both copies using carbon paper. He will retain the carbon and return the original to the originator.

When the originator receives the answered or acknowledged copy, he will retain this copy and discard his carbon copy.

Exhibit V-2-16. FIELD TRANSMITTAL, FORM A-102

Form A-102 (AGROSTAN)
(March 1971)

MINISTRY OF ECONOMY
NATIONAL STATISTICAL OFFICE

FIELD TRANSMITTAL
1971 CENSUS OF AGRICULTURE

A. Province or zone | Code

B. Routing
☐ Supervisor to PCO(TCO) →
☐ PCO(TCO) to NSO

Supervisor's name
District | Code

C. Date sent | **D.** Received by *(Initials)* | Date

OFFICE USE ONLY		PSU	Quantity		Other	Comments
Work Unit No. (1)	District No. (2)	No. (3)	Form A-1c's* (A-1d's) (4)	Payroll authorizations (5)	*(Specify)* (6)	(7)

** List A-1 numbers on back of this form*

Mail **(Blue)** Enclosure **(Buff)** File **(White)**

U.S. DEPARTMENT OF COMMERCE - BUREAU OF THE CENSUS

Exhibit V-2-16. FIELD TRANSMITTAL, FORM A-102--Continued

List of National Certainty Holdings (A-1 No.)					

Exhibit V-2-18. FIELD WEEKLY PROGRESS REPORT, FORM A-104

Form A-104 (AGROSTAN)
(March 1971)

MINISTRY OF ECONOMY
NATIONAL STATISTICAL OFFICE

FIELD WEEKLY PROGRESS REPORT

1971 CENSUS OF AGRICULTURE

A. Province or zone		Code
B. Routing: ☐ Supervisor to PCO(TCO) → ☐ PCO (TCO) to NSO	Supervisor	
	District	Code
C. Date	D. Report period From	To

1. Number of supervisors working (PCO or TCO only)	Number
2. Total number of PSU's	Number

Number of –	This week	From last report	Total to date
a. Enumerators working			
b. PSU's assigned			
c. PSU's with listing completed			
d. PSU's with A-1's completed			

3. Total number of National Certainty holdings	Number

Number of –	This week	From last report	Total to date
a. Enumerators working			
b. National Certainty holdings assigned			
c. National Certainty holdings with A-1's completed			

4. Payments (PCO or TCO only)

Item	This week	From last report	Total to date
a. Enumerators: Training	$	$	$
Listing			
PSU A-1's			
National Certainty A-1's			
Travel allowance			
b. Supervisors: Salaries			
Travel allowance			
c. PCO(TCO) office salaries			
d. Other authorized payment – *Specify source (enumerator, supervisor, office) and nature of expense on back of form.*			
TOTAL →	$	$	$

Salmon – Originator White – Receiver

U.S. DEPARTMENT OF COMMERCE – BUREAU OF THE CENSUS

Exhibit V-2-19. PAY AUTHORIZATION, FORM A-105

(Forms would be prepared in pads of 150 each, alternating white, green, and yellow copies)

Form A-105 (AGROSTAN) (March 1971) MINISTRY OF ECONOMY NATIONAL STATISTICAL OFFICE **PAY AUTHORIZATION** **1971 CENSUS OF AGRICULTURE**	***For use of District Office of Ministry of Economy*** →		A. Payment No.
	B. Province or zone	Code	C. District / Code
	D. Employee		E. Title ☐ Enumerator ☐ Supervisor
	F. Authorization No.		G. Date posted to PCO(NSO) register

Enumerotor/Supervisor: Present to disbursing officer at District Office of Ministry of Economy for reimbursement no later than 30 days after date of issue.

I – PAYMENT TO ENUMERATOR

I certify that _____ (Enumerator) has satisfactorily completed that part of his assignment indicated here and is authorized to be paid the total amount as shown.

Signature:

_____ (Field Supervisor)

_____ (Enumerator)

Date: _____

Job or fee (1)	PSU No. (2)	Amount (3)
a. Training		$
b. Listing approved		
c. A-1 questionnaires approved – PSU's		
d. National Certainty questionnaires approved	Number	
e. Travel allowance		
f. Other authorized payments *(Specify)*		
TOTAL →		$

II – PAYMENT TO SUPERVISOR (Weekly)

I certify that I have worked the number of days shown in item a, traveled the number of kilometers shown in item b, and incurred other authorized expenses, as shown in item c, in the conduct of official business, during the week indicated.

Signature: **Date:**

_____ _____ (Field Supervisor)

_____ _____ (Approving Officer)

Item (1)	Total (2)	Amount *(To be filled by PCO)* (3)
a. Week of _____ to _____	Days worked	$
b. Travel allowance	Kilometers	
c. Other authorized payment *(Specify)*		
TOTAL →		$

Notes

III – RECORD OF PAYMENT *(For use of District Office of Ministry of Economy)*

PAID			RECEIVED
Amount $	By (Disbursing officer)	Date	Amount $
District	Province		By (Census employee)

Employee/NSO (**White**) Disbursing office (**Green**) PCO (**Yellow**) U.S. DEPARTMENT OF COMMERCE – BUREAU OF THE CENSUS

Exhibit V-2-19. PAY AUTHORIZATION, FORM A-105--Continued

INSTRUCTIONS TO THE SUPERVISOR

GENERAL

1. Prepare each authorization in triplicate.

2. Complete items B through G; number each authorization issued in order (1, 2, 3, etc.) in item F.

3. Fill authorizations in ballpoint pen and make no erasures. A correction may be made only by drawing a line through the erroneous entry and writing the correct entry above it, for example, ~~$12.00~~ $14.00. Any correction must be initialed and an explanation given in the "Notes" space.

4. Record each enumerator pay authorization in Section I of your Record Book, Form A-103. Give the white copy to the enumerator; take the green and yellow copies to the District Office of the Ministry of Economy.

Record your own approved weekly pay authorizations in Section III of your Record Book. Send all three copies to the PCO for approval. The approved white copy will be returned to you, and the yellow and green copies will be forwarded directly to the District Office of the Ministry of Economy.

Upon presentation of the copy, the District Office of the Ministry of Economy will assign a "Payment Number" to all copies, then forward the white copy to the NSO and the yellow copy to the PCO for accounting purposes.

I. PAYMENT TO ENUMERATOR

Complete the appropriate parts of this section, as described below, to authorize reimbursement **for each satisfactorily completed portion** of an enumerator's assignment:

a. Training – Authorize payment for training on the **first** authorization issued for each enumerator, by entering the training fee in column 3 on this line.

b. Listing approved – For each completed PSU listing that you have approved, enter the PSU No. in column 2 and the total amount in column 3.

c. A-1 questionnaires approved – PSU's – For each PSU for which you have approved the completed A-1's, enter the PSU No. in column 2 and the total amount in column 3.

d. National Certainty questionnaires approved – Enter in column 2 of this line the number of National Certainty questionnaires which you have approved and the total amount in column 3.

e. Travel allowance – Authorize payment for travel on the **last** authorization issued; enter the travel fee in column 3.

f. Other authorized payment – If you authorize payment of other miscellaneous expenses incurred in performance of duty (bus fare, bridge tolls, etc.) specify the type in column 1, the PSU No. in column 2, and the total amount in column 3.

Total line – Add all amounts shown in column 3.

Signatures – To certify the pay authorization, sign your name as "Field Supervisor," enter the date, and have the enumerator sign on the appropriate line to indicate agreement with the pay authorization.

II. PAYMENT TO SUPERVISOR (Weekly)

Complete this section each week. Refer to Section III of your Record Book to complete column 2. Make no entries in column 3.

a. Week of _____ *to* _____ Enter the beginning and ending dates of the work week in column 1; enter the number of days you actually worked during the week in column 2.

b. Travel allowance – Enter the number of kilometers you traveled during the week in column 2.

c. Other authorized payments – If you claim reimbursement for other authorized expenses incurred during performance of duty (bus fare, bridge tolls, telephone charges, etc.), specify the type in column 1 and the total amount in column 2.

Signatures – To certify your pay authorization, sign your name as "Field Supervisor" and enter the date.

Exhibit V-2-21. ENUMERATOR PAYROLL REGISTER, FORM A-151

Form A-151 (AGROSTAN) (March 1971) MINISTRY OF ECONOMY NATIONAL STATISTICAL OFFICE **ENUMERATOR PAYROLL REGISTER** **1971 CENSUS OF AGRICULTURE**	**A.** Name of province or zone	Code.
	B. Name of district	Code
	C. Name of supervisor	**D.** Posted by ☐ NSO ☐ PCO ☐ TCO

Section I - LISTING AND ENUMERATION

	PSU Listing				PSU A-I's				
PSU No. (1)	Payment No. *(Item A of A-105)* (2)	Name of enumerator (3)	Amount (4)	Date posted (5)	Payment No. *(Item A of A-105)* (6)	Name of enumerator (7)	Amount (8)	Date posted (9)	Notes (10)

U.S. DEPARTMENT OF COMMERCE-BUREAU OF THE CENSUS

Exhibit V-2-21. ENUMERATOR PAYROLL REGISTER, FORM A-151--Continued

Section II - TRAINING AND TRAVEL

Name of enumerator (1)	Training			Travel			Notes (8)
	Payment No. (Item A of A-105) (2)	Amount (3)	Date posted (4)	Payment No (Item A of A-105) (5)	Amount (6)	Date posted (7)	

Section III - NATIONAL CERTAINTY HOLDINGS

A-I No. (1)	Payment No. (Item A of A-105) (2)	Name of enumerator (3)	Amount (4)	Date posted (5)	A-I No. (1)	Payment No. (Item A of A-105) (2)	Name of enumerator (3)	Amount (4)	Date posted (5)

Exhibit V-2-22. SUPERVISOR PAYROLL REGISTER, FORM A-152

Form A-152 (AGROSTAN)
(March 1971)

SUPERVISOR PAYROLL REGISTER
1971 CENSUS OF AGRICULTURE

MINISTRY OF ECONOMY
NATIONAL STATISTICAL OFFICE

A. Name of province or zone

Code

B. Posted by ☐ NSO ☐ PCO ☐ TCO

Name of Supervisor (1)	WEEK OF → _____ to _____				_____ to _____				_____ to _____				_____ to _____			
	Payment No. (Item A of A-105) (2)	Salary (Amount) (3)	Travel (Amount) (4)	Date posted (5)	Payment No. (Item A of A-105) (6)	Salary (Amount) (7)	Travel (Amount) (8)	Date posted (9)	Payment No. (Item A of A-105) (10)	Salary (Amount) (11)	Travel (Amount) (12)	Date posted (13)	Payment No. (Item A of A-105) (14)	Salary (Amount) (15)	Travel (Amount) (16)	Date posted (17)

	_____ to _____				_____ to _____				_____ to _____				_____ to _____			
	Payment No. (Item A of A-105) (18)	Salary (Amount) (19)	Travel (Amount) (20)	Date posted (21)	Payment No. (Item A of A-105) (22)	Salary (Amount) (23)	Travel (Amount) (24)	Date posted (25)	Payment No. (Item A of A-105) (26)	Salary (Amount) (27)	Travel (Amount) (28)	Date posted (29)	Payment No. (Item A of A-105) (30)	Salary (Amount) (31)	Travel (Amount) (32)	Date posted (33)

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